



THE
FERN WORLD.

FRANCIS GEORGE HEATH.



WESTBOURNE,

SHEFFIELD.

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“Ferns, like most things in nature, are sensitive to thoughtful tenderness, and repay that consideration which consists, not in expensive outlay, but rather in loving study of a plant’s likings and dislikings.”

THE IMPERIAL LIBRARY

THE
FERN WORLD

BY

FRANCIS GEORGE HEATH *K*

AUTHOR OF "THE FERN PARADISE," "THE FERN
PORTFOLIO," "SYLVAN SPRING," "SYLVAN
WINTER," "AUTUMNAL LEAVES," "OUR
WOODLAND TREES," "TREE GOSSIP," "MY
GARDEN WILD," "WHERE TO FIND FERNS,"
"BURNHAM BEECHES," "THE ENGLISH
PEASANTRY," "PEASANT LIFE," ETC., ETC.

EIGHTH EDITION

[*Revised*]



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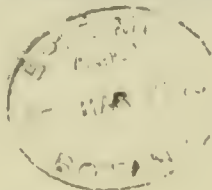
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PREFACE TO THE EIGHTH EDITION.

'THE FERN WORLD' having been out of print for some time, the Author is tempted to re-issue it—this time in an EIGHTH EDITION at what is called 'a popular price;' and the fact that, though dealing mainly with what are known as 'British Ferns'—the species of which are nevertheless to be found in many parts of the world—the general chapters relate to Ferns everywhere, may furnish some reason for the inclusion of this Edition in the series of 'THE IMPERIAL LIBRARY.'

Indeed, the public who have bought the volume are by no means British in the local sense, for it is very gratifying to the Author to know that it has been sold in every English-speaking country in the world.

It is also a further cause for gratification to him to have been told that its descriptions of scenery—modestly put forward as typical of 'Fernland' in general—have induced, as he has been credibly informed, many thousands of its readers to visit the scenes described, though these scenes have been drawn from his own bonny Devon, 'the fairest county of England,' as his friend Mr. Blackmore has truthfully and lovingly styled it.

It seemed fitting that the kind praise bestowed upon the coloured plates in the Earlier Editions should evoke a desire to improve them for an Eighth Edition, and this has accordingly been done by having them entirely redrawn, an improvement, as the Author believes, being effected by more

delicacy of colouring applied to the figures after these had been carefully traced so as to include every detail of the venation. A new cover has also been furnished from the design of a clever artist—Mr. John Carey.

UNDERWOOD,
KEW GARDENS, SURREY,
January, 1898.

PREFACE TO THE FOURTH EDITION.

I AM made aware of the fact that this unpretending Fern Book has achieved a success never yet attained in so short a time by any previous work on the same subject, since Fern Culture has become a popular pursuit.

The FIRST EDITION was exhausted within a week or two of its publication : half of the SECOND EDITION was ordered before the day of issue ; the remainder, with a THIRD EDITION—which was speedily called for—have secured a rapid sale which has found no abatement even during the months of winter ; and a FOURTH EDITION is now demanded.

So practical and so cordial a recognition of my endeavours to popularize the study and cultivation of Ferns is as pleasing as it is surprising to me. For this result, however, I am gratefully sensible of my obligations both to the Fern-loving Public and to the Press. Amongst the former it is pleasant to know that I can number not a few who have recognized an old friend in the Author of 'THE FERN PARADISE,' and who have permitted me to take their hand once more and journey with them into the Fern World.

To my Reviewers my obligations are indeed great for the eloquent and enthusiastic praise which they have bestowed upon my book—the work of one who has simply endeavoured to make his readers share his own enthusiastic love of Nature.

I must take this opportunity of acknowledging the kindness of those Fern-lovers who, not only from my native

county of Devon, but from numerous parts of the country—North, East, South, and West—have privately conveyed to me expressions of their approval of a work which, from cover to cover, has been to me truly a labour of love. The knowledge that this labour has been the means of giving pleasure to so many readers would have amply repaid me even had my work been—what it has not proved to be—an arduous undertaking.

To one and all of my Fern-loving friends—now a very numerous host—I tender my sincere thanks.

FRANCIS GEORGE HEATH.

LONDON,
January, 1878.

PREFACE.

IF the welcome accorded to 'THE FERN PARADISE' by more than a hundred kind Reviewers, and the manner in which that modest 'Plea for the Culture of Ferns' has been received by the Fern-loving public, may be taken as any indication that the subject of the volume is a thoroughly popular one, and one which interests a very wide circle of readers, the Author has abundant encouragement to continue and expand his endeavours yet further to popularize the study of a class of plants which are unquestionably—if delicacy of form, and depth and richness of colouring are to count for anything—the most graceful and beautiful amongst the many and varied forms of life in the vegetable world.

The object of the present volume is twofold. It seeks to inculcate a love for the study of Nature, and to do this by making the reader better acquainted with that world of beauty—the world of Ferns. If any of those who may peruse these pages should be led beyond the pursuit which they recommend; if they should be led up from the shadowy world of 'cool grot and mossy cell' to that upper world which Nature's God has clothed with the bright forms and many-hued blossoms of sun-loving plants, then indeed will the Author's work be crowned with a success which he covets. He at least is content in this present volume to lead those who will follow him into the world of Ferns; for he ventures to think that, in the whole round of botany, there is no other branch of the subject the study of which is at

once so fascinating and so well calculated to create a passion for further researches in so delightful a field as is the study of Ferns.

Although the descriptions of Ferns given in Part V. of this work have been restricted to the British species of these beautiful though flowerless plants, it must be remembered that the same species are widely distributed over the world—occurring, amongst other places, more or less, throughout America and the English-speaking dependencies of the British Empire. Of the fifty species of Ferns, for instance, which are inhabitants of the United States of America, no less than sixteen, or about one-third, are also natives of Britain. Canada also includes a considerable proportion of British Ferns amongst its Cryptogamic flora; and throughout the whole of North America are to be found no less than thirty of our forty-five British species. One half, too, at least, of our British Ferns are to be found in the Himalayan Mountains. If we turn to the antipodean range of the Fern world, we find that New Zealand, with its glorious wealth of Fern life, contains a not inconsiderable number of the British species; and it is worthy of especial remark that both Britain and New Zealand are the richest in Ferns in their respective latitudes. The Author trusts, therefore, that Section V., no less than the sections of the volume which relate to the whole world of Ferns, may possess an interest for English readers beyond the narrow limits of the British Islands.

In furtherance of the twofold object of *The Fern World*, the Author, whilst he has striven to include in the volume much that is of interest in connexion with the subject of which it treats, has sought—at every step—to refer those who may follow him through its pages to the unfailing guidance of that wonderful and beautiful Book—the Book of NATURE.

THE ILLUSTRATIONS.

THE AUTHOR desires to take the opportunity of making grateful acknowledgments for the assistance which he has received in the work of illustrating this volume.

The illustration placed as frontispiece is from a very beautiful photograph of an amateur Fernery in Town, taken by kind permission of Mr. Giles Yarde, of Lamb's Conduit Street. For the photograph the Author is indebted to the kind and courteous assistance, *en amateur*, of Mr. Robert B. Marston.

The three full-page engravings on pages 31, 117, and 141, are from the very beautiful series of Devonshire views of Messrs. Francis Frith and Co. of Reigate, to whom the Author is indebted for the very courteous permission to use them for the purposes of this volume.

Of the coloured illustrations the Author merely desires to say that they are printed from photographs of fronds collected and grouped by himself. It would have been opposed to the object of this work to illustrate it by mere *drawings* of Ferns—for the best drawing is frequently but a poor imitation of Nature. By bringing the marvellous and beautiful process of photography into requisition, it has been possible to copy the very lines of Nature herself. To Messrs. Emrik and Binger this process of Nature printing has been entrusted, and the Author gladly takes the opportunity of acknowledging the rare fidelity with which the work has been executed.

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Part I.

THE FERN WORLD.

THE FERN WORLD.

INTRODUCTION.

A WORLD—apart—of dreamy beauty, of soft vapours and chequered sunbeams. A world—below the glare of noon-day—filled with the most delicate and graceful of the forms which Nature's God has made to clothe the earth with a mantle of green. A world where Nature's own sweet music—the silvery music of the streamlet's ripple—falls, gently cadenced, on the ear: or where the stillness of repose is unbroken, even by the hum of insect life. A world sometimes of darkness relieved but by the faintest gleam of light; sometimes of open rocks and streams, where the roar of the torrent echoes over the mountain side, and rushing water reflects the golden colouring of the sun-rays. A fairy world hidden away under the covering of rugged rocks on the sea-shore, beneath moss-covered stones in the river's bed, or in the depths of the primeval forest.

This same world of moisture and shadows is inhabited by various forms of plant life. The mysterious Fungus there makes its home. There, too, the Lichen creeps over its surface of stone or wood, the Sea-weed clings to its dripping rock, and Mosses on floor of earth, wood, or stone, make a soft green carpeting. But above all these forms of vegetation, yet in some degree related to them, stand the Ferns—

at once, though flowerless, the most graceful and beautiful of their lower world.

God, in His goodness, has, with a liberal hand, scattered these beautiful plants nearly over the whole of the earth's surface, only the sterile regions of the frigid poles being deprived of them. But their abundance or scarcity in any part of the world depends upon the existence, in greater or less perfection, of those peculiar conditions of growth which these moisture-loving plants require. In Europe, Asia, Africa and America, as well as in the islands of the seas, they are to be found, and both in tropical and temperate climes. Over the whole world, more than three thousand distinct species have been discovered; but the variations from the normal forms of these species reach a far larger number than three thousand.

It is curious and interesting to note the proportion borne by Ferns, in those great divisions of the world which we call 'zones,' to flowering plants. Within the colder regions of the polar circles we have seen that they cease to exist. Just outside those regions, but within the boundary of the frigid zones they are found in the proportion of one Fern to eight flowering plants. In the torrid zone they stand in the proportion of one to twenty flowering plants, whilst in the temperate zones they are in the proportion of one to seventy flowering plants. In England and Wales Ferns are doubly as numerous in relation to flowering plants as in the temperate regions generally, and in Scotland the proportionate number is even somewhat greater as compared with those regions.

But it is in the tropics that Ferns acquire their greatest degree of development, for in the depths of the great tropical forests, under the influence of the prevailing heat and humidity, they attain the size of trees, giving to those forests a strikingly graceful aspect, and even in the open

country adding a distinctly-marked element of beauty to the charm of the scenery.

Tree Ferns within the torrid zone grow twenty, thirty, forty, and fifty feet high, often exceeding even that height. Yet, majestic as are these great tropical Ferns when found



growing in such situations, and under such circumstances, their size takes nothing from the grace of their forms. Indeed, they are as much superior in grace and beauty to the other arborescent growths of the forest, as the lesser species of this charming order of plants are superior to the rest of the vegetable kingdom. Naturally, therefore, the

gigantic fronds of the great tree Ferns wave more gracefully in response to the gentle motion of the wind than the more rigid branches of other forest tree growths. But their delicacy of form is due to the peculiar conditions under which they grow, and not least to the soft moisture which continually surrounds them. Those of the graceful family which are exposed to the sun's rays, wear a duller hue, and have less of the depth and brilliancy of colour, and less of the graceful drooping habit which are so characteristic of the species which hide beneath the deepest of the greenwood shade, or snugly nestle under the semi-darkness of clefts on the mountain side, or great rocks on the sea-girt shore. Sunshine and the free play of the air give greater stability and rigidity to these plants, but rob them of some of their characteristic beauty. It is the peculiar combination of heat, moisture, and shade in the great tropical forests, that encourages not only the most graceful but the most luxuriant growths of tropical Ferns. Such conditions, indeed, are, more or less, always congenial to vegetation, and hence it is that as they abound to so great an extent in the tropics, it is there that we find the greatest perfection in the gorgeousness of Nature's garments. There, too, it is that the animal as well as the vegetable world wears more deep, rich, and brilliant colouring than in our soberer temperate climes. Hence those climes cannot produce the most luxuriant growths of Fern life, or its most brilliant and gorgeous colouring—neither the palm-like arborescent kinds, nor the gold and silver species which flourish in the tropics.

We nevertheless possess in our British Ferns a great wealth of beauty and grace, and in some parts of these islands we have them in such profusion as to constitute a distinct element in the beauty of the landscape, whilst oftentimes in our woods and forests they acquire a luxuriance of growth almost suggestive of their tropical head-quarters.

In whatever part, however, of the world these beautiful plants exist, whether in tropical or temperate climes, they add a singular charm to their surroundings. Even when they grow on some wide expanded heath, under the open canopy of heaven, and in the full rays of the sun, they bring delicacy and grace to the scene, however wild and rugged it may otherwise be. If they grow beneath the shady under-wood of a forest, they add a mystic and tender charm to the gloomy beauty of the place. When they are scattered over the great boulders which may stud the roaring bed of a mountain torrent, or are perched on the tiny islets of a gently murmuring stream, they are still the feature of crowning beauty as their waving fronds move responsively to the breeze, and kiss with their delicate tips the tumbling water, as if caressing the element which ministers to the most vital principle of their existence. When they clothe the sides and tops of jagged rocks, they appear as if placed there to soften the ruggedness of the stony surfaces; and when they grow in the clefts of dwarfed or stunted forest trees, they help in such places to make amends for the incompleteness of Nature, whilst they lend their own half-mystic charm to minister to the pleasure of beholders.

CHAPTER I.

THE GERMS OF FERN LIFE.

IN the whole vegetable world there is nothing more beautiful than the process by which Ferns become developed from the almost mysterious atoms, which are, so to speak, the starting points of their existence. It is indeed nothing less than marvellous that plants of such exceeding beauty and gracefulness, and characterized by such wonderful diversity of form, should be produced from germs which are in most cases almost infinitesimal, or so small as singly to be unseen by the naked eye. In what manner these minute atoms are produced by the parent plant, how nursed upon its fronds, how stored and protected from injury during the process of preparation for that final stage in their germ history at which they are launched forth to commence a separate existence in the Fern world, we shall subsequently inquire. We have now to speak of the germs as we find them fully endowed by the Creator with the mystic power which enables them to pass through their beautiful and wonderful stages of growth.

Here it will first be necessary to point out that the germ atom of the Fern—beautifully named a *spore*—has little analogy with the seed of an ordinary plant. The spore differs from the seed both in the nature of its construction and in the principle of its growth. A seed is in truth a miniature plant compressed into a tiny space. This plantlet or embryo consists of two principal organs united to each

other. The one is the *radicle* or the germ of the future root, the other is the *plumule* or the germ of the future stem, which in the process of development gives rise to branches and leaves, or to smaller stems and leaves. Wherever or however a seed may fall, there can be no change in the respective functions of its radicle and plumule. The one is sure to strike downwards into the soil, and the other is equally sure to rise above the ground.

The spore is not so constituted, nor does it become developed after the manner of the seed. It consists, in fact, of a tiny cell, which is of various shapes in the different genera of Ferns, sometimes being globular, sometimes oval, and occasionally angular in form, with an exterior that is sometimes plain, sometimes streaked, or otherwise beautifully marked, and either smooth or bristling with little points. From the part of this minute germ-cell which happens to lie downwards proceeds the root, whilst from its upper portion proceeds the frond. When the spore has fallen into a congenial position for germination, the process of development commences by the enlargement and multiplication of the cell of which it consists. This cell becomes divided after a short time, and forms an aggregation of little cells, which take the shape when expanded of a minute patch, like a tiny leaf laid flat on the ground. This leafy scale, as it may be termed, is mostly irregular in shape, but is usually somewhat round or heart-shaped. Its colour is green, and it bears the somewhat euphonic name of *prothallus*. Under the prothallus—which attaches itself to the earth or rock by fine rootlets—begin to be produced a number of other little cells of a peculiar kind. They are in fact of two kinds, and may be called for the sake of distinction, sperm cells and embryo cells. One of the latter contains a frond-bud or imperfect germ, imperfect because it has to be fertilized before it can commence the process of development. The sperm cells contain

minute, active, thread-like bodies called *spermatozoids*. At a certain stage in the germination of the spore, the frond-bud emerges from its cell, and the spermatozoids about the same time issue forth from their cells, and coming into contact with the bud or embryo, the latter becomes fertilized. Soon after this process has been completed, the spermatozoids lose their activity and finally disappear. The prothallus, too, commences to decay, and finally, with its little system of cells, it dies, leaving in its place only the fertilized frond-bud, which, however, at this stage has no defined likeness to the future and complete frond. The under portion of the frond-bud lying next the damp soil soon however begins to form the root-stock, which subsequently gives rise to the rootlets that absorb and convey to the plant the moisture without which it could not live, whilst from its upper portion proceeds the stalk.

Steadily the process of development continues, until at length a tiny Fern is produced, whose form and habit begin to assume a likeness to the form and habit of the parent plant. In all Ferns which are not annual, including the large majority of this class of plants, the process of development is so slow that it is generally two or three years before it is completed. This is the case with the small and herbaceous species, whilst in the case of the shrub-like and the tree Ferns, the period from the commencement to the completion of growth is considerably longer.

Not the least wonderful circumstance in connexion with the minute germs of Fern life is their singular vitality. The dust-like spores, if kept secure and dry for a long period of years, will often, even after such an interval, when subjected to the necessary degree of heat and moisture, commence and continue the process of development.

CHAPTER II.

CONDITIONS OF GROWTH.

THERE is a wonderful adaptation of means to an end in the circumstances under which the germination and development of Fern spores take place. The same conditions of growth must exist for the germ as for the mature plant—Nature having wisely ordered that the spore shall be of such a construction that it cannot survive the influence of conditions which would be fatal to the full grown Fern.

The conditions essential to the growth of both spore and mature Fern are, generally, moisture, warmth, and shade. Unlike the gayer inhabitants of the vegetable kingdom, Ferns mostly avoid the sunshine and hide in shadow and misty gloom. In such positions it is that they delight to revel, and though their fronds may sometimes perchance play with the sunbeams, they must have moist crevices for their roots. These cannot indeed survive even the temporary absence of moisture, for in such circumstances they shrivel and die.

We have seen that Fern spores are almost infinitesimal atoms, countless myriads of which when blown from the frond having but the appearance of a tiny cloud of brownish dust. So light are these minute germs that they are readily borne away by the faintest breath of wind. When dispersed from the receptacles in which they have lain ensconced, vast numbers of them undoubtedly perish through falling upon uncongenial soil, or upon “stony places,” unprovided with crevices moist enough to shelter and nourish the delicate life

of such minute germs. But in their very abundance, Nature makes provision for the risks to which they are exposed. The tiniest Fern is provided with the means of producing a vast and uncountable number of germs for the perpetuation and multiplication of its kind; and when the proper moment arrives—that at which the fructification has reached its most perfect stage, and the atomic life germs are separated from the parent plant—the light and aerial messengers are sent forth to seek in every corner of their immediate world, for the resting places which can supply the peculiar conditions of growth that are essential to them.

From what has been said, it will be inferred that Ferns, though hardy in their own particular way, cannot survive an amount of drought that many other plants can bear without material injury. Hence it is only in those positions in which conditions of moisture can be perpetually maintained that spores can live. Indeed, after germination has commenced they hang upon the threads of an existence which is far more fragile than that of seeds, for the temporary withdrawal of shade and moisture would be fatal to their delicate life.

Spores oftentimes fall upon surfaces which, though sufficiently moist to allow of the commencement and continuation of germination, are not—either from the nature of the soil, or the position—suitable for the proper growth and development of the particular Ferns represented by the spores. Those whose natural habitat is on the spongy soil which lies under the deep shelter of a forest would not find the sides of rock or wall congenial to their growth. The Sea Fern could not live on the expanse of an open forest glade, where the Brake often grows in wild luxuriance. Nor could the latter thrive on the damp sides of a dark sea-cave. The Fern of the plain is not the Fern of the dripping hollow, nor are the rock-and-wall-loving species adapted to the soft soil of the spongy hedgetop. It sometimes happens that Ferns which delight

in a depth of spongy soil, and in the damp luxuriance of the hedgebank, are found growing on the almost bare sides of rock or wall. But in such situations they drag on but an unhealthy existence, and become shrivelled in size, ungraceful in form, and deficient in colouring.

The Common Polypody, the Hartstongue, and the Black Maidenhair Spleenwort for instance, are often found growing in stony places, their rootlets getting what moisture and nourishment they can from the tiny seams of earth or leaf-mould in the interstices between the stones. But forlorn-looking indeed are these rock-and-wall-growing specimens compared with those that are found in the moist hollows of pollard trunks, on the dark margins of rushing streams, or in the depths of shady hedgebanks.

CHAPTER III.

STRUCTURE.

HAVING ventured thus far into the Fern world, we must pause ere we further pursue our explorations, in order to inquire concerning the structure and constitution of its wonderful and beautiful inhabitants. Their position in relation to the rest of the vegetable kingdom we shall discuss anon. Here our inquiry must be limited to the field suggested by the heading of this chapter.

Ferns, as we have seen, stand at the head of their lower world, and hence their structure more nearly approximates to the upper—and sunnier—world of flowering plants than any other members of their class. Like flowering plants, they have roots, stems, and leaves. Let us call the two latter by their proper names of *caudices* and *fronds*. The last-named designation is especially necessary as a means of distinguishing in Ferns those organs which, though in their appearance the most nearly like what we call leaves in ordinary plants, are nevertheless very different in some important particulars from leaves. The caudex, or stem, is the root-stock of a Fern. From it grow—downwards—the fibrous rootlets, and—upwards—the fronds. There are two principal kinds of caudex. The one is generally upright and trunk-shaped—sometimes, as notably in the case of tree Ferns, raised to some height above the ground; the other is creeping in its habit, and is called a *rhizoma*. The rhizoma in some Ferns creeps along or with its circumference half

under the surface of the ground. In other Ferns—the common Bracken is an instance—the rhizoma creeps quite underneath the surface, throwing up its fronds at intervals from its upper side, and sometimes descending to a considerable depth in the earth, whilst the rootlets, which are thin and fibrous, insinuate themselves into the damp earth, or into the soft veins of rock or stone on which the Fern may be growing, drawing thence by absorption, and conveying to the stem and frond the essential moisture. When the



rhizomas merely creep along the surface of the ground, they are frequently furnished with hairs, or thick scales, which give them a shaggy appearance, but serve as a protection to the succulent root-stock which they cover. These creeping stems are of various sizes in the various species, in some being little more than stout fibres, whilst in other species they are thick and fleshy. The rootlets, or root-fibres, are in the same way proportioned to the size of the rhizomas; in the larger species growing to some thickness, and in the

smaller ones being but the tiniest of delicate filaments. From various parts of the upper side of the creeping rhizomas spring the fronds, and it thus happens that, as the former advance—dividing sometimes into branches, and penetrating the soil in all directions—the Fern multiplies, often rapidly, throwing up a miniature forest of waving fronds, and sending into the earth at each point where the rhizoma develops into green life a mass of fibres, which



serve at these successive stages to infuse more vigour into the plant.

There is something very beautiful in the arrangement by which Nature provides for the collection by the rootlets of Ferns of the moisture which the latter require for their nourishment. In the earlier stages of growth it is found that the rootlets are mostly supplemented by fine hairs, which cover their surface, and, by capillary attraction—that most mysterious and wonderful power—absorb moisture from

every damp surface, either of earth, stone, or rock. As the rootlets acquire age, they become oftentimes tough and wiry, insinuating themselves into the tiniest crevices, and often extending their progress to considerable distances from the root-stock. Should the situation of the plant be such that possible drought might deprive it of moisture, the rootlets, as if by instinct, penetrate deeply into the earth, bank, or rocky seam, in search of distant and moister crevices than those in the immediate vicinity of the caudex or rhizoma. In such cases, and after a Fern has remained undisturbed for years, the great mass of these delicate fibres, ramifying in all directions, constitutes a marvellous and beautiful system, built up as a protection against the plant's great foe—drought.

Before we conclude our remarks on the root-stocks of Ferns, let us notice those which in a large number of the species are upright in form, and raised above the surface of the ground. Sometimes—and indeed in the majority of instances—they are raised but slightly, often not more than an inch above the ground level or bank on which they are growing. The upper portion of the root-stock is in such cases formed into a crown, which is the basis from which the fronds spring. The crown is practically formed of a circle, or circular cluster of fronds, of the bases of fronds in a fully-developed plant, and of the buds merely of the fronds in an undeveloped or unopened state. Of the position and arrangement of the fronds we shall have more to say anon. Here we have only to explain how the elongation of the crown is caused. Each year's circle of fronds as it decays leaves the bases of its stems upon the crown of the plant. These stem-bases, rising each year one stage higher, gradually heighten the crown, the various sets of fronds all leaving their lower parts in continuation of the process. We have already seen that this process is carried on oftentimes, where the con-

ditions of growth are favourable, until the stem of the Fern is raised, as in the gigantic cryptogamic growths of the forest, to a height of as much as fifty feet. And from the crown of the plant at this height continue to be thrown out, as before, a beautiful circlet of fronds. There are some British Ferns which exhibit this same tendency to an elongation of the caudex, and one species exhibits a tree-like stem, which is often raised two feet or more from the ground. But the absence of the extreme heat and moisture of tropical climates prevents the stems of the majority of our native Ferns from exceeding the moderate length of two or three inches. From the crown of the caudex, and from various points along the upper side of the rhizoma—in Ferns with creeping stems—spring the fronds. These consist of two distinct parts, which may be generally likened to a stalk and a leaf. What would correspond in an ordinary plant to a stalk is in Ferns named a *stipes*—plural *stipides*—whilst the upper portion, or the leafy expansion, is carried upon an extension of the stipes called a *rachis*—plural *rachides*. In compound fronds the continuation of the stipes, or the mid-rib of the frond, is called the primary rachis. If the leaf be divided, with divisions having mid-ribs branching out on each side from the rachis, these mid-ribs become each a secondary rachis. We return, however, to the stipes, or stalk, of the frond. There is very considerable variety in the length and appearance of the stipes in the various kinds of Ferns. Sometimes it is so short that the lower leafy portion of the frond almost touches the crown of the root-stock. Sometimes it is of considerable length, and indeed there are varying and intermediate degrees of length in the different species. The colour and thickness also vary. Sometimes the stipes is thin and delicate; sometimes stout and fleshy. In some species it is bared of any covering; in others it is densely or sparsely covered with various-coloured,

chaffy-textured scales. Sometimes it is extremely brittle and herbaceous, and sometimes tough. Amongst the most beautiful forms of the stipes in Ferns are those which are clothed with scales. Occasionally they are so thickly covered that when they grow up in a close circle around the crown they give a curious cup-shaped appearance to the plant, the inside of the cup being a mass of downy scales. The stipes tapers from its base, the rachis also getting smaller towards the apex of the leafy portion of the frond. Both consist generally of tissue—in fibro-vascular bundles—which is mostly of a very succulent nature.

We now come to the leafy, or most beautiful and graceful, part of the frond. Here, in the form and colouring of the various species, we find almost infinite variations. The explanation of all the differences observable in these exquisite organs of Ferns would fill a large volume. Sometimes the leafy portion of a frond is simple and undivided in form, presenting the appearance of an even-edged leaf. Sometimes the leafy portion, though undivided, has its margin beautifully cut in, or indented, the indentation assuming various shapes, often being deeply incised. In other cases the incisions reach down to the rachis, or mid-rib, of the frond. From this form there is an almost infinite variety of divisions of the frond, the rachis, or mid-rib, giving origin to secondary mid-ribs, and these to others branching from them, and so on, each mid-rib bearing its leaflet, or series of leaflets, and the leaflets bearing their more or less indented lobes.

The various divisions of the fronds of Ferns can, however, be most readily understood by the use of two or three simple terms applied in the descriptions of botanists. Where a frond is a single undivided leaf, without any indentations in its margin, it is termed *simple*. If it has a single leaf, deeply incised, but the incisions not reaching down to the rachis,

its form is described as being *pinnatifid*, the expression being derived from two Latin words—*pinna*, ‘a feather,’ and *findo*, ‘I cleave.’ Should the incisions reach quite down to the rachis, so as to entirely separate the leafy divisions, the frond is called *pinnate*, and each division is a *pinna*, becoming *pinnæ* in the plural. If, in the same way, the *pinnæ* are again divided, the term *bi-pinnate* is applied to the frond. When this mode of division is continued through another stage, the frond is termed *tri-pinnate*. If the frond be more than thrice divided, it is described as being *de-compound*. A *pinnule* is the next subdivision of a *pinna*, and a *lobe* the division of a *pinnule*.

It is the fronds of Ferns which afford the most ready means of distinguishing them from other plants, and the signs of distinction are principally two. The first which may be noticed is the curious way in which fronds are, not folded, but rolled in. When they first start from the crown, they have somewhat the appearance, as they push above it, of a nest of little scaly balls. As they grow upwards, they look like scrolls in process of unrolling, or like the uncoiling of a watch-spring. If the frond be simple and undivided, the unrolling upwards goes on until the whole stipes and leafy portion have been rolled outwards from the base of the stipes to the apex of the frond. If it be a *pinnate*, *bipinnate*, or *tripinnate* frond, the *pinnæ*, *pinnules*, and *lobes* are similarly rolled out from their bases to their apices. It is curious to note in the compound fronds that the processes of unrolling in their upper parts and in their lower or basal *pinnae* take place almost simultaneously; for so soon as the first upward unrolling in the direction indicated by the stipes and the principal rachis has liberated the lowest *pinnæ*, these commence to unroll, whilst the primary unrolling is continuing upwards: and the next and succeeding *pinnae* above the lowest commence one after the

other, as they are alternately unrolled, the same process. In the same way also, so soon as the pinnae, beginning with the lowest, which are always, as we have seen, the first to be liberated, are left free from the principal coil of the frond, they, if compound—i.e. containing pinnules and lobes—set in motion the same process, the first unrolling taking place—the rolling being always from base to apex either of pinnule or lobe—at that part of the pinna next the principal rachis. The unrolling by alternation goes on in the same manner throughout the whole length of the frond, the highest pinnae being the last to be unrolled. Briefly, then, the process may, as we have seen, be described to be—in fronds other than those which are simple—the unrolling of the principal coil from base to apex, followed in alternation by the lateral and perpendicular unrolling of pinnae, pinnule, and lobe.

The chaffy and various-coloured—though usually brown or rust-coloured—scales, which, as we have noticed, are frequently found clothing the stipides of Ferns, are, in a number of the species, continued along the backs of the rachis and its branches sometimes covering the entire under-surface of the fronds, and giving to them, in such cases, a remarkably hairy or shaggy appearance. In some of the species the scales give a singularly beautiful appearance to the fronds. As to the size and arrangements of these scales, they are found to be largest at the base of the stipes, getting smaller upwards, and being smallest at the highest point of the primary rachis, and at the points furthest from the bases of its branches.

We have now to indicate the characters which especially serve to distinguish Ferns from other plants. Under what is called the 'natural system' of botany the vegetable kingdom is divided into two great groups of plants, namely, flowering and flowerless plants. At the head of this latter division stand the Ferns. These beautiful plants, however,

though flowerless, are seed-bearing. But they do not get their seeds, like other plants, through the medium of flowers, for the curious fact is that their seeds or spores are always, under a very beautiful but singular arrangement, borne either upon the backs or on the edges of their fronds. The vegetable tissue of which the fronds of Ferns are composed is traversed by a series of veins arranged sometimes in parallel lines, sometimes being forked in various ways, and at other times variously radiating from the bases to the edges of the pinnae, pinnules, or lobes. The seed-clusters are generally borne upon or attached to the veins at the backs of the fronds, although in some instances the *receptacle*—the name of that portion of the veins to which the spore cases are attached—is projected beyond the edge of the fronds.

The particular form and position of these seed-clusters serve as a means of classifying Ferns, or enabling them to be grouped in accordance with a convenient arrangement. When they are borne upon the back of the frond they are usually arranged either in lines or in heaps. Sometimes they are arranged in a double row along each side of and parallel with the mid-ribs of the pinnae; sometimes in double rows on each side of the mid-veins of the pinnules; and sometimes they form two lines which meet at an angle on each pinnule, the point of union of the lines being towards the apex of the pinnule. In other cases they form oblique lines on each side of the mid-veins, the lines starting from near the mid-veins and proceeding outwards to the edges of the pinnules. Sometimes they almost completely cover the under-surface of the pinnules of the frond, whilst occasionally they are in turn themselves concealed by a dense cloud of scales which thickly cover them. Again, in some cases they are borne along the outer edges of the under-surface of the pinnules or of the lobes of the pinnae, and sometimes, as we have seen, they are projected beyond the leaf margins.

The manner in which the spores are collected on the backs of the frond is extremely curious and beautiful. They are contained in little cases which are known by the name of *sporangia*—singular, *sporangium*, which means ‘a spore vessel.’ The sporangium is of a thin or horny texture—sometimes semi-transparent, and sometimes opaque—usually consisting of a single cell, and generally either globe-shaped, pear-shaped, or oval. Sometimes it is furnished with a very short stalk. There are two kinds of sporangia in Ferns, the one kind—including the great majority of known Ferns—being surrounded by a jointed elastic ring which passes round the sporangium, either in a horizontal, a vertical, or an oblique direction, whilst the other kind is altogether destitute of a ring. The collection or cluster of spore cases is often arranged under the protection of a scale-like covering called the *indusium*. Where this organ is present, it continues to cover the clusters of spore cases until the development of the latter bursts the membranous scale. Each separate cluster of spore cases whether covered or not, is called a *sorus*, from a Greek word which means ‘a heap’—plural *sori*. Some Ferns, however, have no indusia over their sporangia, the latter being naked or non-indusiate. When the sori are what is termed *marginal*, that is to say, when they grow along the extreme outer edges of the backs of the pinnules, it often happens that the leafy margin of the pinnule is turned back to cover them and to serve as an indusium.

In the case of those Ferns whose sori are covered by indusia we have seen that the growth of the spore cases acting upon the indusia bursts the margins of the latter, which are then either wholly or partially thrown off. Subsequently the bands or jointed rings which encircle the spore cases either vertically, horizontally, or obliquely, are burst by the elasticity of the rings, and the fine dust-like spores are dispersed. Sometimes the indusium takes the form of a cup

or urn in which the spore cases are contained, and which in the same way at the proper season liberates the latter by bursting.

Some Ferns possess two kinds of fronds, barren and fruitful, the former bearing spores, and the latter being without them. In some instances the two kinds of fronds are not distinguishable from each other. But in other instances the form of the fruitful frond materially differs from the barren one. The relative lengths of the stipes and of the leafy portion in fronds vary considerably in different species. Sometimes they are equal, sometimes the stipes is much longer than the leafy part of the frond, and sometimes the contrary is the case.

CHAPTER IV.

CLASSIFICATION.

A DEEPLY interesting study is here opened up for the lover of Ferns. These beautiful plants do not consist of a confused mass of individuals, possessing no resemblance to one another, and having no characters in common. They bear such distinct relationship to each other as to admit of their being arranged systematically into various large and small groups.

If we regard the whole Fern world as itself but a *class* in the sub-kingdom of cryptogamic plants, we shall find that this class will admit of being further divided, according to certain well-marked characters of the groups composing it, into *orders*. The orders, in turn, admit of further grouping into *genera*—singular *genus*, the latter into *species*, and species into *varieties*. Let us, for the moment, lose sight of the minute division of our flowerless plants into varieties, and regard only that aggregation of individual plants which is termed a species. A species, then, includes an assemblage of individuals, which, generally speaking, may be said to closely resemble each other. The accidental circumstance of size may temporarily prevent actual or immediate resemblance. But it is assumed, for the sake of the comparison here instituted, that two individual plants of the same species, of the same age, and growing under precisely the same conditions, are alike. If between individuals so closely resembling each other there are certain minor, though well-defined and tolerably

constant distinctions, these constitute what are called varieties. Ascending, however, from the collections of individuals which we range under species, we come to what is called a genus—a term which includes one or more—generally more than one—species. A collection of species having certain marked and important points in their structure in common constitutes a genus, and an assemblage of genera, differing in many respects from each other, but still having certain features in common, constitutes an order. By such a method of arrangement or classification we are enabled to group the inhabitants of the Fern world, and exhibit the relationship which exists between them.

It will now be interesting to inquire what are the points of resemblance or of disagreement which suggest the inclusion or the exclusion of certain forms of Fern life under or from particular orders or groups. Before the time of the great Swedish naturalist, Linnæus, a rude and imperfect system of classifying plants had been adopted. The rougher features of Ferns, for instance, were selected in order to facilitate and guide systems of classifying them. When it was found that there were points of resemblance in the general appearance of the fronds and in the habits of the plants, the fact was considered sufficient to warrant their classification in groups, marked by these general or rough characterizations.

Linnæus, however, and those who followed him, invented and perfected between them a system of classifying Ferns in accordance with the points of resemblance suggested by the shape and position in the several species of the seed clusters, which in general pass under the name of *fructification*. As the fructification of Ferns takes place upon some part—either in the middle or at the ends—of the veins which intersect the leafy substance of the fronds, the particular character of the veining of the fronds has

formed one means of establishing a basis of classification. But the chief mode of distinction or association has been suggested by the presence or by the absence of the scaly covering of the seed clusters, which, as we have seen, is called the indusium, as well as by the form of the latter, and the particular manner in which it may be disrupted when the time arrives for the ripening and setting free of the spores.

If we take those inhabitants of the Fern world which are to be found in Great Britain, Ireland, and the Channel Islands, we shall find that the whole of them may, under the system of classification based on the form and arrangement of the spore cases, be included under three principal groups comprehending lesser groups, which, in their turn, comprise genera, containing a varying number of species. The primary groups, which, as we have seen, are three in number, are called—1. *Polypodiaceæ*, a group containing ten lesser groups, including sixteen genera and forty-one species, and comprising Ferns whose fronds are, on starting from the crown, found to be rolled up in a circinate or scroll-like manner, and having their spore cases surrounded by an elastic ring, which, when it bursts, does so by a transverse fracture. 2. *Osmundaceæ*, comprising in Britain only one genus, of which there is but one species. The group, however, comprised under *Osmundaceæ* includes Ferns which, although their young fronds are rolled up like those included under *Polypodiaceæ*, have no elastic ring round their spore cases, the latter, consisting of two valves, bursting in a vertical manner. 3. *Ophioglossaceæ*, comprising two genera and three species in Britain, and including Ferns whose fronds are not rolled in in a circinate or scroll-like manner, but are folded up straight, and whose spore cases are—like the Ferns comprised under *Osmundaceæ*—deprived of an elastic ring, and two-valved.

CHAPTER V.

DISTRIBUTION.

WE have seen that Ferns are distributed all over the surface of the world, both on continents and islands, with the exception of the sterile parts of the polar regions. To give, therefore, in detail a mere list of the numberless localities in which they are to be found would necessitate the space which a library of volumes alone could afford; and such a list could never be complete, because the limits of the Fern world are continually being extended under the operation of the almost infinite power of reproduction possessed by those beautiful plants. Wherever the conditions of existence continue to be favourable, Fern life is maintained; and whenever such conditions are created in localities where they did not previously exist, there, in course of time,—the interval depending on the proximity of ferny growths,—forms of Fern life will appear. Hence no mere dry and detailed list of the habitats of Ferns throughout the world would possess much permanent utility; and such a list, if full and complete, would, as we have said, vastly exceed the limits of the present volume. When we come to deal with the Ferns of the British Isles, we shall anticipate the especial interest which English readers feel in this particular subject by including in our chapters, under the heading of each native species, the counties or districts in which it has been found; and to make this list in years to come, and in future editions of this work, as perfect and complete as it is pos-

sible to be, we would here take the opportunity of inviting the co-operation of our readers, by asking them to furnish us with any facts of interest bearing upon any new localities—not here enumerated—in which Ferns have been found.

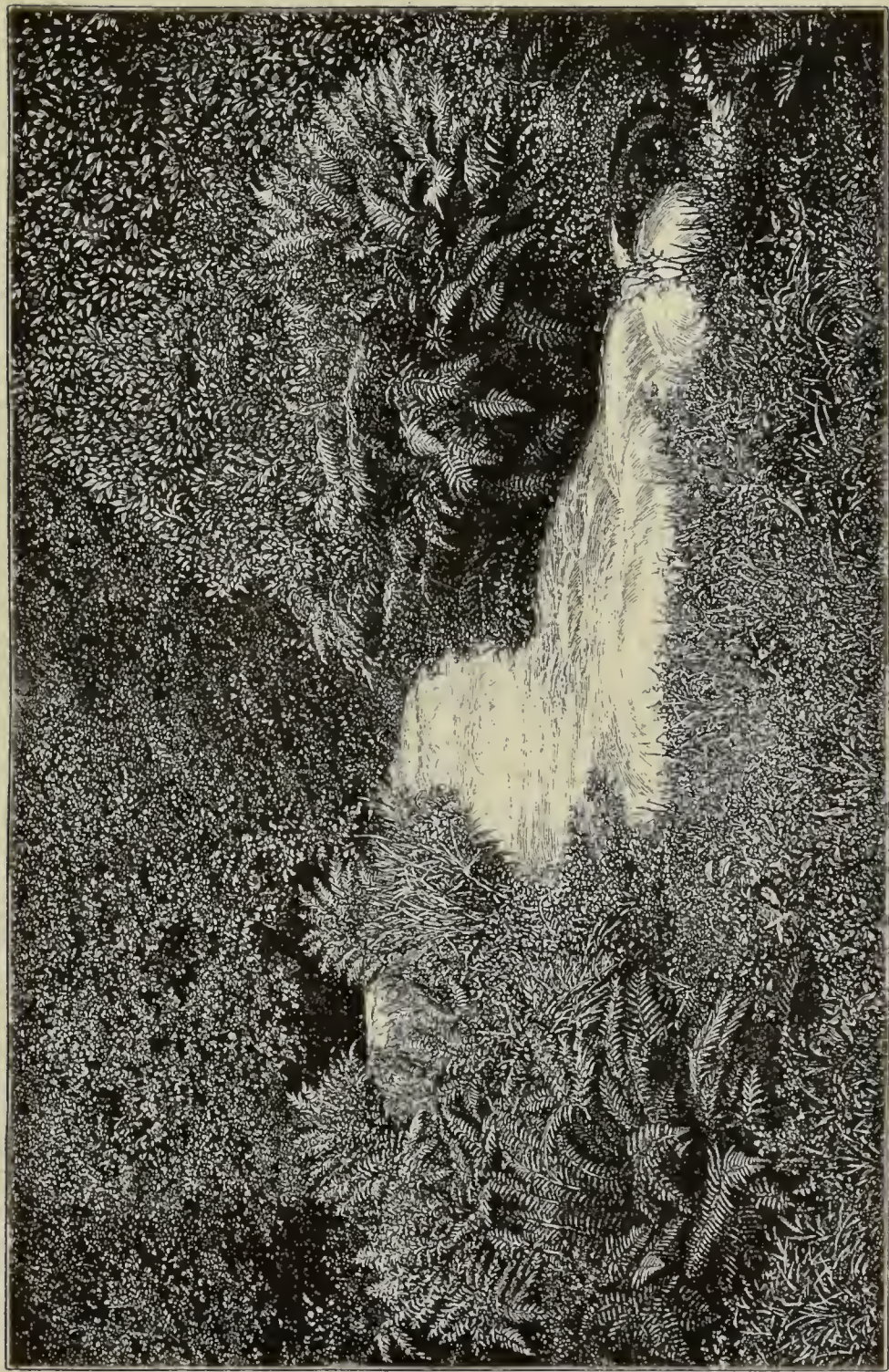
The object of this chapter will be to indicate the situations in which Ferns love to grow, having regard to the general character or nature of the locality, the aspect, the position in relation to the surface of the ground, and to the natural features of the country, and to the nature and constitution of the soil. If this part of the subject be mastered—and there is little difficulty in mastering it—the reader will know, wherever he may chance to be, whether he is in or near the confines of any portion of the Fern world; and when once he has carefully noted his whereabouts, he can easily ascertain whether the conditions which promote ferny growths are present or absent.

Ferns are associated with the most beautiful portions of this world's surface. The most graceful of Nature's garments, they seek to clothe, not the dull expanse of level plain, or the bare, straight side of hill or mountain. They do not grow on sandy flats, on the even margin of a sluggish river, or on the smooth and rockless lines of sea coast. Where the scorching sun-rays fall unscreened upon arid earth, and where no shadows relieve the course of a far-reaching expanse of open country, no ferny growths are found. It is where nature is in her wildest moods, and assumes her grandest aspects, or where the beauty which is spread over rock and wood and stream is of that dreamy kind which most powerfully stirs the imagination and enthrals the soul, that Ferns are found in the greatest perfection, waving their graceful fronds in response to the mountain breeze, or bending under the weight of spray drops flung upon them from the impetuous mountain torrent.

Ferns love to grow where the land is musical with run-

ning water ; where great woods fling their shadows upon the hillside, and hang darkly over stream-crossed valleys ; where rivers, wandering over the crests of towering rocks, and leaping from the sunlight, fall foaming into dark pools, bristling below with sharp points of stone, to be carried thence, in fury, down steep inclines to the sea ; where for long miles the landscape undulates into heathery waves, broken by clumps of gorse on rocky mounds, sheltered by prickly hawthorn or trailing sprays of blackberry ; where undulating meadows, cleft into many a sheltered hollow, roll gracefully away as far as the eye can reach ; where storm-tossed waves roar upon the rugged points of a rocky coast, and echo into many a cavernous hollow moist with the perpetual droppings of percolating water ; where, in short, mountain and valley or hill and glen commingle ; and towering rocks or stately woods, jutting knolls and arching branches play with sunshine and shadow and caress the sides of running streams, whose sparkling waters give birth to soft, moist vapours.

Enough has been said to show that Ferns delight in moist and shady places, and, thoroughly in keeping with their soft and graceful habit, they love light and porous soils where their roots can keep free from stagnancy. On shady slopes and modest elevations they mostly like to dwell. Fibrous peat and sand, and the spongy mould of fallen leaves, form soils in which these plants delight. Through such soils water always percolates freely ; for stagnant moisture is fatal to Fern life. Hence the sloping sides of a mound or hedge-bank ; the crest and sides of rocky elevations ; the forks of trees where leaf mould has accumulated ; the shaded margins of running brooks or larger streams ; the moist caverns in the sides of cliffs above the tide-mark ; the mossy crests of islets in mid-stream ; the sloping, sheltered hill-sides ; even the moister hollows of the plain, and the broken depths of



“Where the land is musical with running water.”

forest glades and forest coverts, are the sites which are most congenial to ferny forms, and which most readily adapt themselves to ferny growths.

It will be seen that the presence of Ferns in any place assumes the pre-existence of conditions favourable to their growth. They are never found absent from an old forest. Let us inquire the reason of this, and examine into Nature's preparations for their reception. The presence of clustered trees for a long period of years gives rise to the formation of a surface soil which is composed of the decomposed remains of the crops of leaves which, in the deciduous species of trees, annually fall to the ground. Leaves upon leaves accumulating form the most perfect vegetable mould, and this, built up upon the porous subsoil and largely intermixed with the root fibres of plants which have sprung up and died down each year, constitutes a soil—at once rich, light and porous—in which Ferns especially delight. The sheltering canopy of trees, whilst it keeps out the sunlight, keeps in the moist emanations from the ground, and thus creates other conditions which are essential to Fern life. Within a forest the ground is generally uneven and diversified. Banks of rocks or earth are found scattered about—the former cleft into various shapes, forming hollows and crevices of various kinds—the latter mostly covered by some species of vegetation of dwarf or shrubby growth, and overarched by the taller growths of the forest. In the hollows and crevices of the rocks, and upon the top and sides of the earthy banks leaves perpetually fall and decay, and in course of time form a leafy soil, which mingles with crumbling rock or earthy granules, it may be, of sand or gravel. Upon such places Fern spores drop, and find the situation suited for them by reason of its moist and sheltered position. Soil and position being congenial, the spores develop into plantlets, and these in time into full-grown

Ferns. The conditions which favour their early existence are maintained. The soil is annually enriched by additional deposits of leaf-mould, and, the moisture and shelter continuing, the Ferns grow to maturity, and then spread their myriad atoms of reproduction, which, wafted to other rocky holes, moist banks, and old, moist forks of trees, soon fill the forest with graceful ferny forms, covering sloping banks, waving from the crowns of pollard trunks, and draping rock and river with their feathery tresses.

Or take the case of a stream which flows rapidly through a mountain gorge, or along the boulder-strewn bed of a valley. Vegetation of large growth—trees or giant shrubs—will follow the course of such a stream, for its moist channel is favourable to the development of vegetable life. The stream brings moisture; the trees or other growths bring shelter; the force of the current makes and maintains holes and fissures in its earthy or rocky bed. These are filled with leaf-mould from dropping leaves, and with sand and fibres from the carrying stream. Then Nature begins her work, and plants her small growths of moss, lichen, and Fern on the dark moist surfaces of earth or rock. The process of dwarf-forestry commences, and slowly and surely the whole ground-plan is draped with a mantle of living green.

Chance, perhaps, has thrown together in mid-stream some shapeless masses of rock: the water brings down a contingent of broken branches torn from their parent stems by the force of high winds, or fallen under the process of natural decay. The jutting masses of stone arrest the woody fragments, and these in their turn catch the passing whirl of stream-borne leaves, and dam the earthy substances washed down from the banks of the stream above. A process of accumulation commences. The mass thickens and strengthens, and some bold plant starts up from its centre. Others follow, and their matted roots consolidate the sub-

stance, which by degrees acquires increased consistency and becomes an islet. Amongst the earliest of vegetable inhabitants are the mosses and lichens, and then the domain is appropriated as another portion of the Fern world by the appearance of some representative of the moisture-loving family.

Again, the face of the country may be traversed by gentle risings of the ground, and intersected by hedge-banks dividing the domains of pasture, or corn land, and skirting a network of roads and lanes. If the soil be rich, and the roadways narrow, the banks of earth or loosely-built stone may be crowned by stately shrubs or trees, whose branches cross the way between and meet each other. Then upon the hedge-top, or on the hedge-bank, leaf-mould gathers, and ferny forms assemble and greet the passer-by.

Let it be remembered, however, that the various members of this beautiful family of plants have varying predilections in the matter of soil and position. Some seek the drenching moisture of the waterfall, or the dripping walls of sea-caves. Others can live and thrive in the moderate moisture of sloping banks under the shelter of shrubs, or trees, whilst others still will grow on the open surface of an undulating plain. But, with few exceptions, Ferns mostly love to be elevated, even if but slightly, above level surfaces. It is percolating moisture which they love—moisture which does not rest about their roots, but passes away immediately into the soil below. And there is a beautiful consistency in the love of these plants for sloping banks and jutting knolls, for only in such positions can they show to advantage their graceful and beautiful forms.

CHAPTER VI.

USES.

THOSE who have been fairly inoculated with the love of Ferns, will be interested to learn that many species of these beautiful plants are used not only for food and medicine, but for economic purposes. As food, they are chiefly useful to the aboriginal inhabitants of some foreign countries. In the larger of the exotic Ferns—the tree-like species—the inner part of the stem, stipes or rhizoma—corresponding to what would be the pith in other plants—and sometimes, the whole of the tuberous rhizoma, is eaten generally after being boiled. In India, some of the natives boil the tops of one species of Fern, and eat it with shrimp-curry. Amongst ourselves, two of the most beautiful species—the Bracken and the Male Fern—are said to have been sometimes used as ingredients in the manufacture of beer; whilst one foreign species (*Aspidium fragrans*) is actually stated to have been used for making tea. Our native Maidenhair used at one time to furnish a principal ingredient for a syrup called ‘capillaire,’ which can be made in this way:—To one ounce of the fronds of the Maidenhair must be added a quarter of an ounce of liquorice-root, and one pint of boiling-water. The ingredients after standing six or seven hours should be strained, and to the resulting liquor must be put one quarter of a pint of orange-flower water and two pounds of loaf-sugar.

But it cannot be contended that Ferns can compete with other plants as articles of food for man. They have, how-

ever, a great repute as items in the pharmacoepœia of the herbalist, on account of the medicinal properties possessed, or supposed to be possessed, by many of the species. In the economy of the arts and manufactures, they find, too, a place. Let us notice the chief uses, in the senses indicated, of some of the most familiar of our ferny forms.

We will take first the Male Fern (*Lastrea filix-mas*). In Siberia it is said to be used in brewing on account of the flavour which it imparts to ale; whilst in Norway the incipient fronds in their unfolded state are plucked, boiled, and eaten as a kind of 'asparagus.' They are even preserved in a dry state, when gathered in the summer; and, when winter comes, are given to cattle after being soaked in boiling-water. In many countries this Fern has been regarded as a powerfully astringent medicine, especially valuable as a vermifuge—the part used for that purpose being a powder made from the dried root-stock, and administered with syrup, treacle, or jelly, as an electuary. Culpeper avers that being burned, 'the smoke thereof driveth away serpents, gnats, and other noisome creatures which in ferny countries do in the night-time trouble and molest people lying in their beds with their faces uncovered.' As it abounds in alkali, it is also used in the dressing of leather, in the manufacture of soap, and for other purposes.

Our native Brake (*Pteris aquilina*), a Fern common to many parts of the world, has uses very similar to those of the Male Fern. In parts of Normandy it has been, it is stated, used as food. In the more northern countries of Europe, it is used in the manufacture of beer; the proportion used for brewing being one part of the rhizoma to two parts of malt. Pigs, too, will eat the roots readily if they are boiled with their other food; and we have often seen the green fronds eropped, with satisfaction, by horses. The ashes of the plant, when burnt, make a valuable manure,

being especially recommended as favouring the growth of potatoes ; and for the reason, that they contain a very large proportion of nitrogen. They are also sold to glass and soap-makers ; and in some parts of the western isles of Scotland, their collection and sale form the staple of a regular industry. Mixed with water, and dried in the sun, they make balls which are used by the inhabitants of some parts of North Britain as soap for the washing of their clothes. Being, like the Male Fern, a powerful astringent, the Bracken is useful in the manufacture of leather. Besides furnishing when dried, a light fuel to the rural population, in some districts it is used for the thatching of houses. If the young shoots are gathered and simmered in water over a fire for two or three hours, the liquid makes when cold, a kind of jelly which is recommended as fattening food for pigs. The fattening quality of this Fern no doubt arises from the fact that it, like the Male Fern, contains an abundance of starch. Like the Male Fern, also, it has been used as a vermifuge. But of all the uses to which the Brake is put, none is so familiar as its employment for the packing of fruit ; and there is a well-founded belief, that its utility in this way is due to its power of resisting mildew, and keeping fresh the articles packed in it. This belief may account for the circumstance that it has been used in the Isle of Man for the packing of freshly caught fish. It is believed, too, to possess great virtues as a covering for potatoes, when the latter are buried in the ground ; and it has been noticed, in many cases, that it keeps these tubers very much better than straw, or any other article used for covering them. But, perhaps, the most pleasant association of the Bracken in the public mind is with fragrant-scented strawberries in the early summer season. Who is not familiar with its fronds in this way ?

The rootstock of the Royal Fern (*Osmunda regalis*) was

in times gone by reputed to possess the quality of healing wounds, whether applied to them externally, or taken inwardly in the form of a decoction. Its outward application was considered a specific against bruises or sprains, and good for bones broken or out of joint; and, taken inwardly, it was also believed to be good for cholic and for splenetic disorders. In some parts of Europe its rootstock is said to be used, after being boiled in water, for the purpose of starching linen.

The reputed power of curing splenetic diseases has given to a group of Ferns, many species of which are natives of Britain, the name of Spleenworts. Some of them, indeed, were at one time believed to be effectual in cases of cough and asthma, and for scorbutic complaints. One species, the Common Maidenhair Spleenwort (*Asplenium trichomanes*), is used in some parts of the Highlands of Scotland, in the form of tea, for the cure of coughs and colds; and in a herbal, published three centuries ago, the virtue of keeping the hair from falling off, and restoring hair in the place of that which had fallen off was ascribed to the same Fern. A gummy extract to be obtained from the Sea Spleenwort (*Asplenium marinum*) was also considered some hundreds of years ago to afford—if applied outwardly—great relief from burns, even when all other applications had failed. The virtue of effectually benefiting persons attacked with splenetic disorders has also been ascribed to the Hard Fern (*Blechnum spicant*). The Scaly Spleenwort (*Asplenium ceterach*) is used as bait for rock cod on some parts of the Welsh coast. It is also, according to Culpeper, considered to be a remedy for ‘all melancholy diseases’ if the ‘herb and roots’ be ‘boiled and taken.’

A pleasant and familiar inhabitant of our lanes and woods—the Common Polypody—(*Polypodium vulgare*) has had ascribed to it, by ancient herbalists, various medicinal qualities,

amongst them being the power of curing coughs and asthmatic affections, the dried rhizomas being powdered for the purpose and mixed with honey.

Finally, to two or three Ferns common in many parts of England, the Moonwort (*Botrychium lunaria*), and the Common Adderstongue, various wonderful properties have been ascribed. The Moonwort has been considered an antidote for wounds, and the Adderstongue—‘an herb,’ according to Culpeper, ‘under the dominion of the Moon and Cancer,’—is supposed to owe its name to its reputed power of curing the bites of adders and of other reptiles. From it an ointment is made called adders-spear ointment, which is supposed to be a specific cure for recent wounds, and is a good deal used as a popular remedy for them. It is made, according to Culpeper, of ‘the leaves, infused or boiled in oil, omphacine, or unripe olives,’ set in the sun for certain days, or the green leaves ‘sufficiently boiled in the said oil.’ He says, that amongst other things it ‘helps sore eyes;’ and if the juice of its leaves be drunk with ‘the distilled water of horse-tail,’ it ‘is a singular remedy’ for ‘all manner of wounds.’

Culpeper gives a quaint and curious account of the Hartstongue. He asserts that ‘Jupiter claims dominion over this herb,’ and he adds, ‘therefore it is a singular remedy for the liver, both to strengthen it when weak and ease it when afflicted.’ He recommends that ‘you shall do well to keep it in a syrup all the year; for, though authors say it is green all the year, I scarce can believe it.’ Such a recommendation may indeed well be adopted; for we go on to read that the distilled water of Hartstongue is ‘very good against the passions of the heart,’ as well as ‘to help the failing of the palate.’ It is also good, according to the Grecian botanist Dioscorides, against ‘the stinging and biting of serpents.’

The quaint writer already referred to—Culpeper—speaking of the ‘Maidenhair,’ which is evidently the Common Maidenhair Spleenwort (*Asplenium trichomanes*)—and of the Wall-rue, or ‘White Maidenhair’ (*Asplenium ruta-muraria*), says that a decoction of either ‘being drunk, helpeth those that are troubled with the cough, shortness of breath, yellow jaundice, diseases of the spleen, etc.’ Further, it ‘cleanseth the lungs, and, by rectifying the blood, causeth a good colour to the whole body,’ and ‘the lee made thereof’ is ‘singular good’ for staying the ‘falling or shedding of the hair,’ and causing it to ‘grow thick, fair, and well-coloured,’ for which purpose ‘some boil it in wine, putting some smallage seed thereto, and afterwards some oil.’

A number of remarkable qualities are ascribed, by Culpeper, to the ‘Three-branched Polypody, or ‘Polypody of the Oak,’ as he calls it (*Polypodium dryopteris*), which is, we are told, especially good for ‘those that are troubled with melancholy or quartan agues.’ For application to such purposes it should be taken ‘in whey, or honied water, or in barley water, or the broth of a chicken with epithymum, or with beets and mallows.’ ‘It is good for the hardness of the spleen as also for the colic.’ The distilled water, both of roots and leaves, besides being good ‘against melancholy,’ is ‘good’ also for ‘fearful and troublesome sleeps or dreams.’ If this distillation have sugar-candy dissolved in it, it is ‘good against cough, shortness of breath,’ and consumptive tendencies. If the fresh roots ‘beaten small,’ or the powder of the dried roots, be mixed with honey, it will greatly ‘help’ a member which is out of joint.

CHAPTER VII.

THE FOLK-LORE OF FERNS.

It would have been strange indeed if plants so fairy-like in form as Ferns had remained free from all association with the mysterious region which we call fairy-land. Fern-land by day must have been a veritable fairy-land at night; and the graceful companions of Queen Mab doubtless disported themselves ecstatically amongst the feathery foliage of the shade-and-moisture-loving plants.

The fairies must indeed have had an especial fondness for ferny forms, for they chose the twin leaflets of one of the graceful family to saddle their horses with. Shakespeare tells us of Queen Mab, that her waggon-spokes were

‘Made of long spinners’ legs :
The cover, of the wings of grasshoppers ;
The traces, of the smallest spider’s web :
The collars, of the moonshine’s wat’ry beams :
Her whip of cricket’s bone ; the lash of film :
Her waggoner, a small grey-coated gnat,
Not half so big as a round little worm
Prick’d from the lazy finger of a maid :
Her chariot is an empty hazel nut,
Made by the joiner squirrel, or old grub,
Time out of mind the fairies’ coachmakers.’

But sometimes when riding alone she saddled her steed with the twin leaflets from the spike of Moonwort. Now this little Fern grows apart from its kind, on the open face of meadows, under the play of the moonbeams. Look, gentle reader, at its leaflets, and you will see how suggestively they shape

themselves into the form of a diminutive saddle, and how temptingly they spread themselves out and away from the upright stem of the plant, as if inviting a fairy's leap from the fruit-spike! The barren frond would saddle easily half-a-dozen fairies, each pair of leaflets forming a saddle, the neck of which would consist of the mid-stem of the frond where it joined the bases of the opposing pinnules.

Why, however, did Queen Mab select the Moonwort's pinnules for her saddle? When duly equipped, we know that she gallops

'Night by night
Through lovers' brains, and then they dream of love :
On courtiers' knees, that dream on court'sies straight,
O'er ladies lips who straight on kisses dream.'

And access for the fairies was to be obtained to the brains of lovers and the lips of ladies, even when the latter were safely locked in their chambers, by the powerful aid of the Moonwort saddle; for does not an ancient writer tell us that 'It is believed by many that Moonwort will open the locks wherewith dwelling-houses are made fast.'

Another mysterious power was ascribed to this Fern, as indicated by the following lines by the poet Withers:—

'There is an herb, some say, whose virtue's such,
It in the pasture only with a touch
Unshoes the new-shod steed.'

And so great in other ways was its potency that alchymists and witches included it in their herbals.

It is not surprising that some three hundred years ago a good deal of mystery was believed to surround the seeding of Ferns. It was superstitiously considered that these plants were propagated by invisible seeds, although it was thought that the 'black spots' which were found on the backs of their fronds had something to do with their seeding capacities. It was believed that these 'black spots' fell suddenly upon

the Ferns on Midsummer Eve, and that if they were then gathered under certain conditions, they would produce on the gatherer some very potent effects, the chief of which would be the ability to walk invisible. To get the gift of invisibility, however, it was necessary to proceed to 'catch' the Fern seed in the following way. Twelve pewter plates were to be taken at midnight of St. John's Eve, and placed under the 'black spotted' frond. The seed then in falling would pass through eleven of the plates, and rest on the twelfth. Fairies, however, were sometimes in attendance to snatch the seed away as it fell. But if the gatherer succeeded in his attempt, he would thereafter possess the much-coveted quality of invisibility.

Some curious adventures, however, happened to some of the would-be Fern seed gatherers. One person declared that whilst occupied in gathering it he felt unseen spirits whisking by him, and occasionally striking his hat and parts of his body. After a while, however, having borne this ordeal with patience, he went away, carrying with him as he thought an abundant supply of seed. But lo! when he reached home he found the papers and box in which he had carefully secured it perfectly empty. It is recorded, too, that 'a respectable countryman' at Heston in Middlesex, stated that in June, 1793, when he was a young man, he was often present at the ceremony of catching the Fern seed at midnight on the Eve of St. John the Baptist. He records, however, that the attempt was often unsuccessful, for the seed was to fall into the place of its own accord, and that, too, 'without shaking the plant.' Even in the present day this superstition is not exploded, for it is alleged that in some parts of the country—notably in Worcestershire—the country people still keep up their belief in the mystic power of Fern seed to convey the gift of invisibility.

Part II.

FERN CULTURE.

FERN CULTURE.

INTRODUCTION.

FASCINATING as the study of Ferns undoubtedly is when pursued in the wild habitats of these beautiful plants, it possesses an additional attraction from the circumstance that it can be followed in our homes. Fern culture, indeed, in our houses and in our gardens is not merely a popular pursuit. It has become a popular passion, which has been increasing in intensity during many years past. The reason for this is not far to seek. We all know—those of us at least who are lovers of Nature—how delightedly, nay longingly the eye lingers on the wild beauties of the rocky glen, or bounding moorland where ferny forms wave gracefully in the moorland breeze. Other scenes of Nature no doubt have their charms for us. A great expanse of spreading woods viewed from a mountain top ; rolling waves of purple heather or clustered mounds of golden gorse ; a wide expanse of meadow-land, starred by myriad daisy blooms or swathed in the deep rich golden hue of countless buttercups ; the Ocean with its great and ever-changing mass of waters ; or the wide arching sky which canopies both land and sea—all move the soul with sentiments of wonder and delight. But such enjoyments in their full perfection are inseparably connected with the country.

The knowledge that Ferns, on the contrary, can be transported to our home and town surroundings, bringing with

them the wild grace which is their peculiar charm, and the same freshness and beauty which they exhibited in mountain glen, in greenwood shade, or on river's bank has naturally served to create in the public mind a passion for their cultivation. They serve, in fact, to link the town and the town dwelling with the most charming associations of the country. And few, if any, wild plants so readily adapt themselves to a town life, and to indoor culture as Ferns.

This fact it is which has undoubtedly increased the popularity of these plants and made their culture not merely a fascinating pursuit but, as we have said, a passion. And here we would say that it is a principal object with us to strengthen this charming link which binds the country to the town. The successful culture of Ferns must depend upon a close study of Nature: and the closer the study of Nature, in this one of its most charming and fascinating departments, the greater the success which will be obtained. And the process will in every way be beneficial. The mind will be enlightened and brought into a closer relationship to and contemplation of the wonders of Creation. It will in consequence be elevated and purified; whilst the physical health will be improved through the necessity which the study will create for constant communication with the Fern world.

It is a fortunate circumstance that the cultivation of Ferns is a pursuit which admits of being universally followed; and this fact has undoubtedly largely tended to increase its popularity. It may indeed be followed not merely by the rich and by the middle classes, but by the very poorest, and it is scarcely possible to conceive of any circumstances which would from their nature preclude the possibility of enjoying this delightful pastime in some way, even if it be only to a limited extent. The darkest corners of a garden or house can be made available for the growth of most of the species

of flowerless plants. Should the Fern lover be the possessor of a garden and conservatory he will have facilities for growing the whole of our native species; and the necessary outlay need not be great. If he have no garden, and but a few yards of space which he may call his own adjoining his dwelling, he can, even if this space be away from the sunshine and consequently uncongenial for the growth of flowers, fill it with some species of hardy Ferns. If he possess no space either as garden or yard outside his dwelling he can fill his rooms with ferny forms. Every shady window may have its tiny Fern garden, as every sunny window may have its miniature garden of flowers: and in various ways and by various contrivances the whole interior of his house may be ornamented and made beautiful by growing Ferns each in its appropriate nook.

It will be the object of the succeeding papers to show in detail how Fern culture in all its branches can be best pursued. Here in conclusion we would once more urge upon the Fern lover the importance of remembering that the more closely he studies the habits of his favourites in their native wilds, the more complete will be his success in the home cultivation of these beautiful plants. As a clever and genial living writer has beautifully remarked, 'Ferns, like most things in Nature, are sensitive to thoughtful tenderness, and repay that consideration which consists, not in expensive outlay, but rather in loving study of a plant's likings and dislikings.'

Mark closely and lovingly the home of the Fern on mountain side, in mossy cell, on wooded slope, on the soft margin of the babbling stream, or by the torrent's foaming course! Mark it in the still moist depths of the forest, or where on forest glades and breezy heaths its feathery foliage waves softly in the wind! Mark how Nature nurses its incipient form, how tenderly she shelters its graceful after-

growth, how lovingly she waters it with the moisture from dripping rock, with the gentle percolations from the sloping hedge-bank, or with the passing spray of the waterfall ! and having marked these things, follow the teachings of Nature as gently and lovingly as you can.

CHAPTER I.

SOIL AND ASPECT.

NATURALLY, as we have seen, Ferns love shade, moisture, an uneven surface, and a soil composed largely of vegetable elements through which water can freely percolate. The first condition is supplied by a northerly aspect under the shelter of trees or rocks, and of all northerly aspects the north-west is perhaps the best, for it is when growing under such conditions that the most vigorous forms of Fern life are found. Free and percolating moisture, the second condition of perfect Fern growth, abounds in hilly country, and hilly country presents also the unevenness of surface in which Ferns delight. The presence of running streams induces the abundant presence of vegetation, which in its turn, as it decays, produces the vegetable surface soil congenial to our flowerless plants. Upon the sites, therefore, which Nature prepares by the association of the conditions which have been named, Ferns grow and flourish.

The dwelling of the Fern cultivator may be placed upon such a site. His grounds may lie in a sheltered hollow surrounded by hills, margined by a wood, and traversed by running water. In such circumstances Ferns will often come unbidden, growing on garden wall and embankment, on the borders of the running stream, nay, upon the very walls of his house. But the conditions essential to their growth

can easily be improvised where they do not exist, and this can be done upon a scale commensurate with the means at command. First, as to the character of the ground. A survey must be taken which should be a loving study of Nature's requirements. If there be a large space of ground of undulating or uneven character, broken up into banks or ridges and sheltered from the fiery rays of the sun, having a subsoil of clay or chalk and a light surface soil, little change will be required to adapt it to the requirements of ferny forms. If the surface of the ground be flat and the surface soil heavy, the one must be changed by the introduction of banks of earth or rock to promote the inequalities in which Ferns delight, and the other must be removed and a soil laid down composed of peat, leaf-mould, loam, and sand, but with a large preponderance of the two first-named elements. If the subsoil be of clay it will have a natural tendency to retain the moisture which drains from the surface. In such a case it will be found that simple banks and mounds of Fern mould can be introduced without the aid of more rockery than may be required for growing the rock-living species. If the subsoil be light and porous, consisting of sand or gravel, then there should be numerous clumps of rockery, because the stones of which the rockery is composed prevent the rapid evaporation of moisture which always takes place from a gravelly or open and porous soil.

In succeeding chapters detailed hints and suggestions will be given, relating to the various ways in which Fern culture may be pursued under varying circumstances. Enough has already been said on the general subject of soil and aspect. But it will be appropriate before concluding this chapter to indicate the kind of soil which is best adapted for the cultivation of Ferns, and where such soil can be obtained. It must, of course, be premised that although all these plants grow in soil which is very much of the same general

character namely, light, porous, and largely composed either of vegetable mould, or of vegetable fibres, yet that varying proportions of the elements of such soil are required by the various species, or rather in a general way, by the various genera, for it is often found that at least several species of a particular genus will accommodate themselves to the same soil, the same aspect, and the same general treatment.

Under that section of this volume devoted to British Ferns, specific information will be given as to the soil required by each species.

Peat or bog earth must be one principal ingredient in most Fern soils. This can be obtained from any peat bog, and the best part of the soil is the 'top-crust,' and the black earth which is found immediately under the 'top-crust.' The black earth is a rich vegetable compost, the 'crust' is light, turfy, spongy, and largely composed of vegetable fibres intermixed with vegetable earth. A valuable ingredient in Fern soil, also, is the top-crust of a common, or down, on which heather grows. Such a crust is usually fibrous and light.

Leaf-mould from woods and forests, formed by the decaying leaves which annually fall from the trees, is another indispensable and most valuable element in most Fern soils.

Lastly, rich sandy loam is often required for admixture with leaf-mould or peat, and this is best when obtained from the surface of a common.

It is believed by some writers, that the quality of the soil in which Ferns delight is not of so much importance as its capacity to retain moisture, or to keep the roots well drained. But from this opinion we emphatically dissent, believing, as we do, that on the pooriness or richness of the vegetable elements in the soil, largely depend the growth and development of the Ferns planted in it.

Finally, we would remark that although there are several

means resorted to by florists for artificially substituting the natural elements of Fern soil, it is far better to obtain the proper and natural soil ; for in this case, as in other respects, the nearer the approach to Nature, the greater will be the success in cultivation.

CHAPTER II.

GENERAL TREATMENT.

It is a happy circumstance that—owing no doubt to their general hardiness—Ferns can so readily adapt themselves to the conditions imposed upon them under cultivation. It cannot be too often impressed upon the cultivator, that the nearer those conditions can be made to approach the natural conditions of their growth, the greater will be the success in cultivation. Still the majority of known Ferns, and the majority also of those Ferns which are natives of Britain, will readily conform to the general conditions of shade, shelter, and moisture, without a closer approximation to the exact conditions under which they may have been growing in a wild state. It is this fact which makes Fern culture a much easier occupation than it would be, were the plants more sensitive to changed conditions of existence.

In the case of some of the species, however, success in their culture cannot be obtained without a very close study of the natural conditions of growth, and a close approximation to those conditions under cultivation. If, as is often the case, the natural conditions of growth cannot be actually imitated, artificial contrivances are necessary in substitution of natural conditions. If the place selected for growing Ferns be naturally damp and sheltered, no protection or artificial appliance, as we have already said, will be required for most of the species ; and no especial care will be needed in their management. But where the situation selected is uncon-

genial, then, not only are artificial means necessary for the protection of the plants, but constant care and watchfulness are required, in order to prevent the discontinuance of the extemporized aids to growth. To those species, for instance, which require the constant presence of a still atmosphere, loaded with moisture, as do the Bristle Ferns, the Filmy Ferns, the Sea Spleenwort, the True Maidenhair, and others, a covering of glass serves to provide the nearest approximation to the natural conditions—furnished by the atmosphere of dripping cave, or clefts of dripping rock—by retaining moist vapours over and around the plants. The artificial substitution of glass for the moist concavity of the dripping rock can take place in various modes, and upon a scale commensurate with the means at the command of the fern cultivator, or with the requirements of the plants themselves. Thus, the area to be artificially covered with glass may vary in extent from that of a small glen or valley, down to a little ‘greenhouse,’ or conservatory, or to a tiny Fern-stand under a shade or bell-glass; and under all these coverings, by the artificial retention of moisture, and the artificial production and maintenance of heat in varying degrees, providing for the adoption as nearly as possible of natural conditions of growth, the most delicate and beautiful forms of Fern-life—both native and tropical—can be made to flourish. In the same way the hardier Ferns suitable for open culture in the out-door garden, can be treated. If rocks and streams exist on the grounds of the cultivator, no artificial protection and no watchful care will be needed to promote their growth. If the conditions of growth have to be extemporized, this can be done upon a large scale by the erection of huge rockeries, banks, and mounds, and by the introduction of running water, or upon the most moderate scale to suit the circumstances of the poorest cottager, who may have only a few square feet of

space at the back or in front of his humble dwelling. In the same way, if the means at the command of the cultivator permit, natural masses of rock and the natural soil of forest or common can be imported into the Fern garden or house. But if the few shillings required for the importation into the garden on a moderate scale of such materials be beyond the means of the humble cultivator, such a one may grow at least a few of the hardier Ferns, with a degree of success which will brighten the surroundings of the humblest dwelling, in the common soil of the garden, if the requisite shade and shelter be provided.

The succeeding chapters will show how these various methods of culture in these varying degrees can be pursued. It remains under the present heading to make one or two general remarks.

It must be remembered that with few exceptions Ferns cannot endure an excess of moisture about their roots. They love to stand on slopes above the water level, so that but the remotest filaments of their rootlets can sip from the surface of the stream. Hence their favourite positions are elevations in varying degrees above the ground or water-level; and they appear to take these positions as if in proud assertion of their right to stand at the head of their lower world of cryptogamic vegetation. Thus it is that they look down as from a pedestal upon the humbler world of moss and lichen, which are content to carpet the knolls upon which their ferny superiors stand.

In the process of planting, too, it must be remembered that the crowns of the rootstocks must not be buried under the earth, but must be left freely above ground—the under half only being covered with earth. In those species possessing rhizomas or creeping rootstocks, the rhizoma must lie closely *on* but not *under* the surface of the soil; and in either case the rootstock or rhizoma must be firmly planted.

In this, however, as in other matters, Nature furnishes the best model for imitation. Water must be supplied to Ferns in a fine spray from hose or watering-pot—in such a way as to imitate natural rain as nearly as possible—at *all seasons of the year* when there is an absence of rain, and more especially when there is a prevalence of drying winds; for drying winds acting upon the delicate and moisture-loving texture of these beautiful plants will always—if their influence be not counteracted by artificial watering—most prejudicially affect their vitality and growth.

CHAPTER III.

PROPAGATION.

As a branch of Fern culture, propagation, in its various aspects, offers a most instructing subject for study to the cultivator. Of the various kinds of propagation the most natural is that which is performed by the agency of the spores. The process followed in germinating by these most wonderful atoms of plant life has already been described. It remains in this place simply to indicate, for the guidance of the cultivator, how the propagation of spores can be the most easily effected. There are four principal methods which may be described for the raising of spores. They may, when ripe, be shaken from the frond upon the damp convex side of an inverted clay pot of a porous nature, upon the damp sides of a piece of sandstone, upon moistened silver sand, or upon a preparation of compost, which will be more particularly described anon. In all cases there must be a covering of glass over the pot, sandstone, silver sand, or prepared compost.

The best method of raising spores is that last mentioned; and the process may be very simply described. In a pot, the ordinary red clay pot is probably the best to use, there should be put a drainage of 'crops,' or broken bricks, to about half its depth, beginning with a concave crock over the hole of the pot, and putting the next largest pieces over this, and the smallest particles and *débris* last. Then upon this thick stratum of drainage put in a layer of compost

about half the depth of the drainage, consisting of two parts of peat, two parts of silver sand, and one part of good loam—each part representing a fifth of the whole. With this may be mixed some sandstone, or soft red brick crushed into very small pieces; or it is, perhaps, better that the crushed brick or sandstone should be thinly scattered over the entire surface of the compost of peat, sand, and loam. After this the compost should be watered with a fine rose until the mass is moistened through. Upon the surface should be scattered the spores from a ripe frond, and a glass placed over the whole. If the pot be a red clay one it may be covered by a piece of flat glass, which will fit exactly to the rim; or a bell-glass, shade, or other glass covering may be used, according to the size or shape of the pot or stand. When all is finished, the spores sown, and the glass covering put on, the pot must be kept in a dark place. Care should be taken that the compost is not allowed to get too wet or soddened—though it must be kept perpetually moist; not by watering on the surface, for that would disturb the spores, but by standing the pot in a pan of water, two or three inches in depth, for a short time. Ventilation should be given occasionally, by taking off the glass covering for a few minutes. The glass should then be wiped free from moisture; but this should be very carefully done, so as not to expose the germinating spores to any hot, dry currents of air.

After a time, germination having commenced, little thin, filmy, leaf-like patches will be observed spreading over the surface of the soil in the pot. 'These are the 'germ scales,' or, as they are strictly named, the *prothallia*—plural of *prothallus*—produced by the spores. If they are found to have been sown too thickly, and the *prothallia* are crowding each other, they must be thinned, and those taken out—on little knolls of earth—can be moved to another pot, where on a

similarly prepared compost to that already suggested for the first sowing of the spores they may be left free to grow. The process of growth is, in the great majority of species, slow. At the end of a year from sowing the spores, they have only become very diminutive plants, and their progress to maturity is gradual. As they begin, however, to exhibit the familiar ferny forms, a little more light and air should be given to them. It is a most interesting study to watch, from time to time, by means of a magnifying-glass, the gradual growth of the spores.

If heat, through the agency of the plant-stove or hot-house, be used in the process of germination, the latter will, of course, be very materially quickened. Indeed for the spores of some of the Ferns from the tropics, heat is absolutely necessary to induce germination, in the climate of the British Islands.

It will often be found, however, that the natural conditions for the germination of spores provided in the Fern-house, in the case, or in damp and shady clefts of the garden rockery, will cause these infinitesimal life germs to start into existence. On damp earth, on the moist surfaces of the stones, on the earthenware sides of Fern pots, and even on the very stone walls of the Fern-house, they will oftentimes grow. It is, indeed, most curious to note the beautiful manner in which the green germ life of Ferns appears almost everywhere within the neighbourhood of the parent plants, wafted thither in atomic forms which are borne into the air by the lightest breath of wind. Wonderful, indeed, is the power and vitality of these marvellous atoms!

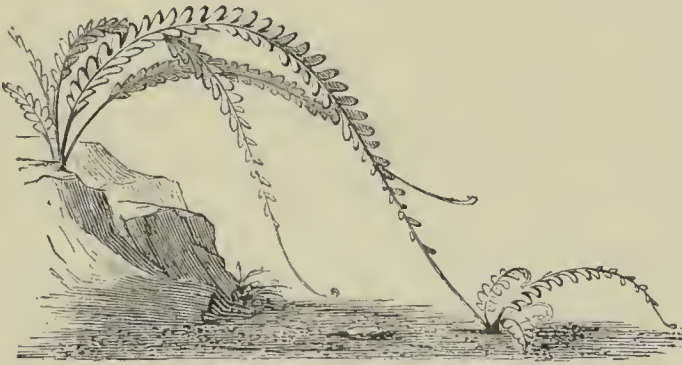
There are other means by which Ferns can be propagated or multiplied than by the agency of spores; and they consist of dividing the conjoined clusters of crowns, or the creeping rhizomas. The caudex of many of the upright growing Ferns is found on examination to consist of two or

more parts joined at their bases. Sometimes these clusters, although connected, stand somewhat apart from each other. In either case, if the point of connexion be divided by a sharp knife, each part will retain a separate existence, and can be separately cultivated. Where Ferns have creeping rhizomas it will be found that at intervals, as the plant travels, little buds appear, which ultimately spring into fronds. All along the under-surface of the rhizomas fibrous rootlets shoot downwards into the earth. The rootlets are more thickly clustered just underneath the parts of the rhizomas which bear the buds already alluded to. As the buds develop, the rootlets underneath multiply, as if to strengthen and maintain the semi-independence of the offshooting frond. Naturally the independence of these offshoots increases as they increase in size, and increase the number of their rootlets. If the rhizoma, therefore, be severed on each side of such a bud, or frond, the latter, with its bit of rhizoma and its fibrous trailing rootlets, becomes the nucleus of a separate Fern, and its hardiness and capacity for immediate and vigorous growth will be proportioned to the strength and abundance of its subjacent rootlets.

In these ways can Ferns be artificially multiplied, and though the process may be accomplished at almost any time of the year, the best time is the season of greatest vigour, namely, the spring, and before the fronds have actually started into growth.

There are some Ferns, however, which bear upon their fronds, sometimes at their apex, and sometimes at the point of junction of rachis and pinna, little offsets, or buds, which, as they grow, are found to be separate plants, with crowns and tiny sets of fronds. When these have grown to a size which admits of their being removed, they can be separated by severing—on each side of them—with the aid of a knife, the

frond on which they are fastened. If they are, when separated, carefully placed in earth—which should cover the detached bit of stem, and just touch the base of the bud, or bulbil—and then kept moist by a covering of glass, they will soon become developed, and ultimately grow up in the likeness of the parent plant. It is, indeed, most interesting to watch the development of these tiny buds when detached from the frond on which they grew. In some Ferns such little bulbils will grow at the base of the fronds, or on the caudex, and in such cases also when severed by a sharp knife



they retain their vitality, and may be cultivated as separate plants.

In the case of other Ferns, if the fronds are fastened down on moist earth, they will take root at the joints of the fronds or where the primary rachis is connected with the secondary rachides; and when the rooting has been properly accomplished, the bud which will appear on the opposite side of the stem may be detached in the manner already indicated, and grown as a separate plant.

It is a curious circumstance, worthy of being noted here, that if the frond of a Hartstongue—severed so as to include the whole of the base, and a tiny bit of the caudex—be planted and kept moist under a covering of glass, it will become rooted and grow into a separate Fern.

CHAPTER IV.

A FERN VALLEY.

THERE is a wide field before the enthusiastic lover of Nature for the indulgence of a passion for Fern culture, if considerations of cost do not stand in the way. What, for instance, could be more delightful, where the necessary expenditure could be freely undertaken, than the creation under glass of a Fern valley? Given a natural valley or gorge between parallel hills, and why might not the space from hill to hill be roofed with crystal, the roof supported at each end with pillars of stone with glass between? Under such a covering, even if the natural features of the site were not of a nature to provide a home for Ferns, masses of rock and a stream of water could be introduced, and, by a proper regulation of the temperature, the most delicate and beautiful as well as the most noble of the cryptogamic growths of the tropics would flourish, and a little fern world of wondrous beauty might be created. On the estates of the wealthy in numerous parts of these islands there is many a rocky glen or valley where the experiment could be tried. If through the course of such a valley, to be thus domed with glass, a natural stream wound its way, on each side tree Ferns could be planted. On its margins the larger species of herbaceous Ferns might be gathered, and so disposed as almost to hide the streamlet's course under a wealth of glorious fronds. Massed up rocks, too, on each side of a rude pathway, running parallel with the watercourse on either margin, might

afford a congenial home for the rock-loving members of the flowerless family. On each hillside above the streamlet many a broad platform of earth or rock would afford space for creeping Brake or clustering Polypody, whilst on many a craggy point and in many a moist and sheltered nook congenial habitats might be found for the Fern of the open cliff and of the dripping eave.

In such a glen or valley, with a climate of moisture and heat, the Ferns of the tropics, forgetting that they were no longer in the humid depths of primeval forests, would unroll their great glossy fronds and rise to a height unknown without the limits of their extemporized world. The Maidenhair would no longer miss the air of the sea-coast, and the glossy-fronded *Asplenium marinum* would develop as grandly as it could in its wild and dripping rocky cavern.

Now let it not be supposed that the picture thus drawn of a Fern valley represents but the dream of an enthusiast. There is many a glen in lovely Devonshire alone, provided by the unbounded wealth of Nature with craggy rock and sparkling stream, clothed and fringed with their native flora. Such glens in summer are veritable paradises, though the cold of our winters euts low the verdant crowns of foliage which charm us as they wave in the summer breeze. But a protecting canopy of glass would, in the summer, change the conditions of the plant-life of the glen from those of our temperate clime to the climate of the tropics; and in the winter—by the use of means for artificially keeping a temperature, during the prevalence of our frosts, of say some sixty or seventy degrees of heat—would maintain and promote the growth of the inhabitants of what would, in truth, be a little sub-tropical Fern world. When it is remembered what has already been done in this country in the direction of raising huge fabrics of glass, it must be admitted that our suggested Fern valley need not be an impossibility

to those who might possess the means of indulging a taste for Fern culture on such a scale.

Nature in the Fern world, though she can provide no covering of glass, often furnishes from the tops of opposing ferny banks a canopy of trees and shrubs, formed by arching branches, under which moisture is promoted and encouraged in a degree which largely develops the cryptogamic life which lies in the sheltered hollow beneath the friendly shelter thus extemporized.

CHAPTER V.

SUBTERRANEAN FERN CULTURE.

THERE are many ways in which Fern culture can be pursued by those to whom the creation of a Fern valley under glass would be an impossibility. The possessor of but a few yards of garden may indeed have, on a small scale and at a comparatively small expense, a little sub-tropical Fern world. How this can be done it is the object of the present chapter to show.

Let an excavation be made in any garden, lawn, or other space at disposal, from eight to ten or a dozen feet in depth, and of any length or width which convenience may suggest. The bottom of such a dell should be gravelled, and the sides either slightly sloped upwards and outwards, or allowed to be perpendicular, or nearly so. Perhaps the best arrangement of the sides of this dell, or cutting, would be one in which the slope would be very slight indeed from the bottom; so managed, in fact, that the width of the cavity at its mouth would be only some three or four feet greater than at the bottom. Along on each side, and at the ends next the bottom, large irregular blocks of stone should be arranged. Upon these other blocks should be placed, sometimes embedded in the sides of the cutting, and sometimes projecting inwards. The process of building up these blocks should be continued towards the top of the dell, care being taken, however, to have no prim arrangement, but to present the rugged appearance of a rough quarry, the blocks of stone

being so built up and disposed as to leave room here and there for a foothold. If all the pockets and interstices were then filled in with proper soil, it would be found that our native Ferns, carefully planted in the sides of such a dell, would thrive admirably, and without requiring, even in the severest winter weather, any protection against frost. The gently outward sloping form of the cavity would admit the rain, which would fall equally upon the surfaces of the jutting ledges of rocks. The path leading into such a subterranean cutting could be sloped gradually down at either end from the ground level to the bottom of the dell. If such a subterranean fernery were covered with glass, it would become sub-tropical, and the most delicate ferny growths could, during the summer, be grown in it; whilst by the introduction of heat, by means of hot-water tubes running along and through it, winter protection would be afforded, and a truly beautiful winter-garden of Ferns could be maintained. Water would be best supplied, during dry seasons, by means of a fine rose attached to a garden hose, and, should the place be covered with glass, regular ventilation would require to be given, but with such care as would prevent an exposure of the underground fernery too long to the influence of a dry and heated atmosphere.

CHAPTER VI.

A FERN GARDEN.

IN all the circumstances under which Ferns are grown, there are perhaps none more interesting than their culture in the open garden, without covering of any kind, and exposed, as they are in their native wilds, to the free play of the elements ; for it is when growing under such circumstances that the best opportunities are afforded for that loving study of Nature which is so essential to ensure success in the culture of these charming plants.

Let us first say that by a Fern garden is meant not a flower garden into which ferns are merely introduced as visitors, but a garden solely devoted to the flowerless inhabitants of the woods. In the succeeding chapter we shall consider how Ferns can best be grown as adjuncts to the flower garden, and so disposed as to fill up shady corners, and form a delightful contrast, by their brilliant shades of green, to the gayer inhabitants of the flower world.

A Fern garden, however, in the sense here intended, must be, whether large or small—for the size will depend upon the means or opportunities of the cultivator—just a bit of Fern land imported into home or town surroundings, as a reminiscence of the country. If the ground to be transformed into such a garden be naturally uneven in its surface, it may not be difficult to adapt it without extensive alteration to the requirements of the new inhabitants to be introduced.

If there be a stream of water running through it, or a pond and fountain of running water, the work of transformation will be rendered comparatively easy. Let us suppose, however, to meet the case of the majority of would-be cultivators, that neither of these conditions pre-exist, and that a flat ground has to be transformed into the ruggedness in which ferny forms delight. The required space may be square, oblong, or of any shape. In its centre make an excavation for a pond or lake, its circumference to depend upon the entire disposable area of the proposed Fern garden. Its depth in the same way must vary according to circumstances, and for this reason, that from the general level of the Fern garden towards the central part—the part to hold the water—of the excavation there must be a gradual slope. If the pond be large, the length of the slope will be greater; if small, less. The entire basin should be no deeper than would be necessary to keep the water at a depth of from twelve to twenty-four inches. Its shape should not be a prim circle, but irregular. An islet might be constructed in its centre, by throwing in some large and irregularly-shaped blocks of stone, placing upon these broken bricks and smaller stones, following with a rough mixture of gravel and loam, and then, finally, above the proposed level of the water in the basin, filling in with a mixture composed of two-thirds of peat, and one-third of rich loam, sand, and leaf-mould. The masses of stone forming the foundations of the islet should peep out above its whole surface in irregular jutting points and angles. The outer edge of the basin might consist of a border of irregularly-shaped stones or rocks, and the passage from it to the islet should be by a natural bridge of variously-shaped stones, not indeed arranged in any consecutive order, but dotted about here and there as Nature disposes them in the wild home of the Ferns. There should be no prim arrangement of the gra-

velled slope around the basin. It should be broken into irregular ridges or banks of earth, and this process would be aided by the free use here and there of great masses of misshapen rock, around and in the crevices of which—and wherever a shady nook or a jutting position might suggest a corner for a Fern—soil should be placed of the same composition as that already described for the boulder islet.

The sides of the suggested cutting or excavation might either run by an irregular slope upwards, to the general level of the garden, or it might lead up to this level, by two or three paths, leaving between them, as a filling up of the remaining portion of the circumference, irregularly-piled up masses of rock, the shady nooks and crevices in which, facing the water, would afford congenial habitats for many of the smaller rock-and-water-loving species of Ferns.

The general level of our Fern garden, above the sloping excavation, should be broken up into rocky ridges and irregularly-formed banks of earth. The free importation of great masses of rock will be found to be a great aid in the disposition of the garden into those irregular surfaces in which Ferns delight. The advantage of a plentiful use of stone, too, consists, it must be remembered, in its capacity to prevent the rapid evaporation of moisture from the earth. As to the kind of stone to be used, it should be, if possible, of the true stone colour, with here and there, perhaps, lighter and darker shades,—no grained or polished stones, no marble, no gaudy shells, no coral. None of the hideous monstrosities called ‘clinkers’ will be admissible. Nor is it desirable to introduce those much-lauded abominations called ‘burrs,’ or conglomerations of brick from the brick-kiln. We would not preclude these humble conglomerations, if the means of the Fern lover prevent him or her from

obtaining better material. But wherever possible pure stone, soft, rough in surface, and absorbent in character, should be obtained. The reason for using such stone for rockwork and for the making of irregular terraces or Fern banks is this. Nature always selects such materials for the disposition of Ferns in a wild state. The absorbent character of the stone is essential, because it is thus able to store up moisture, and give it out again by evaporation. The irregularity of the banks to be constructed has, too, this especial advantage—a larger surface of absorbent material is created than could be done were the surface more level, and a greater degree of moisture is given off by evaporation, thus occasioning that humidity of the atmosphere which is so essential for the healthy and vigorous growth of Ferns. The soft, rough, damp surfaces of rock offer, too, an advantageous ground for the presence of mossy growths, which quickly spread in a green mantle upon such surfaces, thus adding greatly to the greenness, freshness, and beauty of the scene. Fern spores, too, will often germinate on the moist, rocky surfaces, and, ere long, seedling Ferns will peep out, their fibrous roots penetrating the soft bed of rock, and luxuriating in the hidden but palpable moisture.

The straight—brick or stone—walls of such a garden can be deprived of their rigid and unpicturesque appearance, by the disposition upon and over them of portions of cemented rock or stone. Here and there, between rock and wall, openings can be left, and into the crevices upon a drainage of small broken stones or broken bricks, proper soil can be put, and Ferns planted. By such an arrangement the whole surface of the walls might be covered with ferny tufts, and the scene would be made most picturesque and beautiful. Or instead of preserving a higher level for our Fern garden with a sloping approach, there might, as an alternative, be one—gradual and irregular—slope from the

enclosing walls to the water level, broken up between into banks and walls of rock.

If it be possible to obtain a high pressure of water for the central fountain over the basin, a spreader could be substituted for a jet, and in this way a thin misty shower of water could be distributed all over the garden. If its area, however, be too large for one jet to reach all its sides, others could be introduced in convenient positions.

Under such conditions as have been described, there are very few indeed of our native Ferns which might not be successfully grown in the open garden. If the means or opportunities of the cultivator be limited, the plan suggested for a Fern garden could at least be carried out in miniature; and if a sufficiently high service of water could not be obtained to moisten the entire area of the garden, or, if there be no means of constructing a basin of water, there might be a simple arrangement carried out by means of which a modest rill of trickling water could be maintained over a little group of rockery.

CHAPTER VII.

FERN ROCKERY.

FERNS may fairly be characterized, looking at them in a general way, as rock plants ; for there are very few indeed of the known species that cannot be successfully grown on or between the crevices of rocks. Hence, under cultivation, what is called rockery—little eminences, built up irregularly in a pile of any shape, and consisting of a conglomerated mass of earth and stones—affords the best means of arranging these plants, so as to display to the greatest advantage their elegant and graceful forms, and the best means also of accommodating the conditions of culture to their natural requirements.

Of all the various methods, too, of growing Ferns, that of growing them on ‘rockery’ is perhaps the most popular. It is certainly a method which admits of the widest possible adoption ; for, as in the most extensive grounds there is the widest scope for the creation of rockery on a large scale, so, on the other hand, there is no bit of garden so small, and no tiny strip of courtyard so limited, as to preclude altogether the possibility of introducing some little grouping together of rocks in association with at least some graceful ferny forms. Rockery may fill up the entire area of a large space, or it may be used conveniently to supplement any existing garden devoted to flowering plants—to fill up in fact in such a garden the damp and shady corners which lie beyond the borders of the flower world because the brilliant inhabi-

tants of that world cannot live without the genial influence of sunshine. But Ferns court shady corners, rejoice in quiet gloom, and gladly occupy the places shunned by the gayer inhabitants of the sunny regions.

As it will be mostly in shady corners rather than in shady garden glades that Ferns will be placed, let us first see how a fern rockery should be constructed which is destined to fill up either the angle formed by the meeting of two walls or by a single wall and the ground. In both cases the walls or wall will constitute a support—to two sides or to one side, as the case may be—of the rockery. The first operation necessary at the commencement will be the preparation of the site for the rockery. If the surface soil be too light or porous, it will be necessary to remove it to a depth of a foot or so, and fill in the space with good stiff loam. Upon this at the farthest outer edge of the proposed rockery, the largest blocks of stone should be laid. More earth should be filled into what will now be the enclosure between the outer circle of stone blocks and the wall. Then a second circle of blocks next the outer circle, but nearer the wall, should be laid down. Earth should again be filled in at the back, and the process should be continued upwards and backwards towards the wall, the smaller blocks, as a rule, being used for the higher tiers, until the wall is reached. Care must be taken not to give the stones thus arranged in tiers one above the other a prim appearance. They should be placed irregularly, so as to present a variety of aspects, and the levels on each irregular tier should slope slightly backwards or towards the wall, so that when rain or water from the garden-hose or watering-pot falls upon the rockery, it may not run off in the direction of an incline over the face of the rockery, but may sink into and thoroughly penetrate it. The secret of many a failure in the attempt to grow plants on a rockery, lies in the fact that the structure has been built like a cone,

with narrow ledges all sloping downwards and outwards in such a way that most of the water rolls off instead of penetrating the substance of the rockery, and, though wetting the surface, leaving the soil underneath, in which the roots of the plants are embedded, dry. A slight examination of any good rockwork will show the points which it is necessary to observe in this particular.

The process of building up rockwork upon a bank of earth in the manner already explained should be carried on slowly, and great care should be taken to press in well the earth which is to form the body of the structure, so that no hollows or crevices may be left when the work is completed. It will to this end be found useful to water each tier as it is completed in order to consolidate the work. Rain falling upon it will answer the same object, which is to prevent the subsidence of any part of the work when the whole has been completed; for if this happen, it will probably leave many of the roots of the Ferns without earth, and thus present another source of failure, the cause of which will in most cases be undiscovered from the fact of the subsidence taking place out of sight, whilst the upper portion of the plant for a time conveys the idea that all is right.

The earth used for the body of the rockery should consist of sandy peat and loam in about equal proportions. But when the entire rockery has been completed, the various pockets and openings should have the soil removed, if necessary, in order to permit of the substitution to a depth of a few inches or more, as may be necessary, of the particular soil required by the Ferns which occupy the various openings.

As already explained in the preceding chapter, the stones of which all rockery should be formed should be porous and absorbent, and of irregular shape. The various kinds of sandstone are amongst the best when they can be obtained.

as they soon become coated with a covering of moss and seedling Ferns, and thus greatly help to add to the picturesqueness and beauty of the rockery.

If it be desired to build a rockery in circular form on the open ground without the support of any walls, very much the same arrangement must be pursued in its construction as that already described.

When, however, the whole structure is completed, the soil filled in, and everything ready for the reception of the Ferns, great care should be taken in planting them, so that their roots may be well and closely covered, and their crowns firmly placed in the soil in the various nooks and stations selected for them. The larger kinds of Ferns will most suitably occupy the lower positions in the rockery, the higher, more exposed, and somewhat drier parts being devoted to the rock-loving and other small species. There should, in the arrangement of the different species, be no crowding or confusing of fronds. Holes or crevices in many of the blocks of stone will afford convenient places for the stone-and-mortar-loving Ferns.

But lessons in the whole process of constructing a rockery, and in the planting and disposition of Ferns, can best be had from the wonderful teachings of Nature. Half-an-hour's study of a natural rockery in some moorland wild or rocky glen will give more experience in the art of rockwork making than any amount of mere explanation. To Nature, therefore, the enthusiastic Fern cultivator is referred as to the best guide. The garden rockery may be shaped so as to make it a representation in miniature of a rugged hill-side, with its crags and plateaux, its slopes and hollows. If a garden be occupied by successive tiers of rockery, with such a central piece of water as we have already suggested in the preceding chapter, then, if it be still water, it may represent the silent pool pent between rising rocky ridges in the moorland. Or

if miniature fountains be formed, they may represent, in some sense, the cascades of the woods and glens. Half of the pleasure experienced by the Fern lover will be found in the quiet and loving endeavour to imitate the perfection of Nature.

CHAPTER VIII.

A FERN HOUSE.

A FERN HOUSE is simply a Fern garden, with the addition of a covering of glass, and it may be of two kinds—a cool house or a hot-house. If the former, it would afford protection all the year round for all our hardy Ferns, many of which would retain in full perfection, even during winter, their evergreen character, and the fronds of the most delicate species would survive the period of destruction annually introduced by the frosts in the open garden. But if heat be introduced by means of hot-water pipes, supplied by a heating apparatus, then both winter and summer the most delicate of our native Ferns and of the tropical species could be grown with success.

In the house, as in the garden, the great object of the cultivator should be to copy Nature in the disposition of the plants. The structure may be of the size and in the form of an ordinary conservatory, but it should face the north or north-west; and the glass must be ground, or at least shaded by some coating on its surface during the summer, if the position of the house be such that the sun shines upon it. If not, shading of the glass will not be needed. The best provision for ventilation will consist of an opening in the roof, but care must be taken to give ventilation regularly, though the ventilator must not be open during the summer at the hottest time of the day, or for any great length of time. The reason for this is that ferns need the continual presence

of a still, moist atmosphere, and require to be kept out of draughts, more especially of dry, hot air. It is essential, too, that sufficient moisture should be maintained in and around the whole interior of the house by a regular process of watering with a fine hose.

A golden rule, it must be remembered, to be observed in all kinds of artificial watering is to make the water descend upon and around plants in a thin, light, and misty shower, so that not the smallest particle of earth covering the roots may be disturbed. See, in fact, how Nature waters in the shape of rain, and in this respect, as in all others, imitate her as closely as possible!

The most interesting method of arranging Ferns in a glass-covered house is by planting them on rockwork; and in constructing this, it may be convenient to cement together the blocks composing it, instead of—as in the case of the outdoor fernery—merely building the stones up closely together without the aid of cement. It would be desirable, when possible, to place the framework of the Fern house upon a surrounding low wall of stone, as the side rockeries could then be cemented to the stony surface of the walls. If the house be a very large one, and such as to require the support of pillars, these should be not of wood or iron, but of stone; and if they are built up of irregular blocks of stone, they will greatly add to the picturesqueness of the interior. The surfaces of side wall and pillars, if the stones composing them are, as they should be, of the soft absorbent kind, will afford sites for the creeping rhizomas of many kinds of Ferns and mosses, whilst holes and crevices can serve as corners or pockets for many of the smaller rock-loving species.

A very delightful effect could be produced within a comparatively small space by the partial excavation of the site for a Fern house, so that the basement of the house would

be some five or six feet below the ground level. The framework of glass could then, without the substructure of walls, be placed—set on a low rim of stonework—upon the ground. Around the sides of the excavation, just beneath the glass framework, huge blocks of stone could be arranged. Upon these other blocks could be piled in great irregular masses, forming tiers, to which access might be obtained from the bottom of the house. A hollow cemented basin should be prepared in the lowest tier of the house, in imitation of a silent pool at the base of rocks. Into this fish of various kinds could be placed, whilst its margin would afford admirable positions for a fringe of Ferns and aquatic plants. The entrance from the door would first lead down to the basement of the house by a series of rude steps cut in the rocks. By careful arrangement, a great variety of stations for Ferns of various kinds could be formed, and the whole place might be made to wear a charmingly-romantic appearance, like the section of a wild ferny glen. It would constitute, in fact, a delightful winter Fern garden under glass.

CHAPTER IX.

POT CULTURE OF FERNS.

PROOF of the wide adaptability of Fern culture to the circumstances of all classes, even of the humblest, is furnished by the circumstance that one of the most interesting branches of this attractive pursuit is the cultivation of these charming plants in pots. Yet even here, narrow as the field for the exercise of taste may appear to be, there is, nevertheless, a considerable variety of means to the end. Art may be exhausted in the attempt to create chaste and fanciful contrivances for holding individual Ferns in so small a space. The receptacle may be cut in the most delicate forms of crystal. It may be moulded in the most elegant styles of majolica, terra-cotta, or after the most approved designs in silver—nay, or even in gold. We cannot condemn the taste which would seek to surround the charmingly-fronded child of the woods with the most costly productions of man's art. But we would remark that such ornamentations are not needed, and that indeed the simpler and soberer in colour the chosen Fern-pot is, the more charming and graceful will the Fern appear.

But enough of dissertations as to the character of the Fern-pot. Its chief recommendation is that it admits of being placed anywhere. The potted plant represents a little bit of the Fern world. There it is, as we may imagine it, with its gracefully curling fronds and its surrounding of green moss; and wherever it is brought its freshness and

beauty will come with it. Whether in a gloomy room, unrelieved by the presence of any other plant forms; on the solitary window-sill, looking out upon a bleak prospect of bricks and mortar; by the bedside of an invalid; or even in the office of the man of business, it will convey to the beholder a sense of pleasure. To the lover of Nature the sight of it will bring up to the mind's eye scenes of the moorland



—of gurgling brook, of foaming cascade, and of wooded hills and winding valleys.

To promote the successful pot-culture of Ferns, simple and easily-remembered directions are all that need be observed; for here, as in other kinds of cultivation, it is only necessary to provide the conditions which will the most nearly resemble the natural conditions under which the plants grow. We have seen that Ferns especially love situations which, though abundantly moist, are nevertheless well drained.

The potted Fern must therefore have careful regard paid to drainage. This should be abundant, and should consist either of small pieces of broken bricks, or, what is more commonly used, broken potsherds or 'crocks.' Small pieces of hard mortar may, too, be advantageously mixed with the other material, especially when the Ferns to be grown are the stone-and-mortar-loving species. Over the hole at the bottom of the pot should be placed a concave 'crock,' with its concavity downwards. Then upon and around this, and covering the bottom of the pot, to a depth of from one to two or three inches, according to the size of the pot, and according also to the kind of Fern to be grown, the remaining crocks or knobs of brick and hard mortar must be arranged, the larger pieces first and the smaller ones upon them. To prevent stagnancy in the drainage, place in it one or two small pieces of charcoal. As another means of preventing stagnancy, it is desirable not to have too great a depth of soil over the drainage. Neither must the latter be of too great a depth, because in that case the fine terminal roots, which are, so to speak, the scouts of the plant, will be tempted to permeate the mass of crocks during some period when they are kept exceptionally moist; and if afterwards they become drier, though the surface soil of the pot is sufficiently moist, injury will be done to the plant. Upon the drainage of crocks should be placed first, the largest knobs of compost, which must be varied in character according to the species of Fern, but should consist in a general way of fibrous peat, leaf-mould, rich loam, and sand in about equal proportions. The finest portion of the compost must be filled in at the last. It is advantageous to place enough moss to cover the drainage thinly between it and the compost. This has the effect of preventing the latter from descending into the drainage. In large-sized pots there should always be two or three holes at the sides, near the bottom, as well as at the bottom, as better drainage is thereby promoted, and the

chances of stagnancy amongst the crocks lessened. The surface of the soil in the pot should always lie from about half an inch to an inch below its rim. Care should be taken to press the soil firmly, though not too tightly, down into the pot, and the use for this purpose of a sharp-pointed stick is desirable. In planting the Fern it should be held in the left hand, with its crown slightly below the pot rim, the compost having been first scattered over the drainage. The fibrous rootlets should then be carefully spread out and downwards, and the compost should be filled in gradually, and pressed down firmly around the roots, and against the sides of the pot until it reaches just above the lower side of the crown of the Fern. The compost at this stage must not be dry nor very wet, but moderately moist.

When the growth of a potted Fern requires that it should be shifted to a larger pot, the best time for this process will be found to be generally at the end of February or the beginning of March, or just, in fact, as the plants are about to commence their spring growth. It is then that they are in most vigorous health, and hence the reason why they can better bear, at that than at any other season, the experiment of potting or re-potting. But the period for re-potting will be earlier or later, according to the earliness or lateness of the season. It is essential to remember that in shifting Ferns into larger pots it is best to proceed gradually, so that each new pot is only a little larger than the old one. If the pot be too large, and there be consequently a large space of new earth around the old ball of roots and earth, there is a danger that the new soil may become stagnant or sour before the roots from the old ball have had time to permeate it, and thus promote necessary drainage. It is essential to remember that in shifting, the old crocks, which will adhere to the old ball on removal, must not be touched, but placed on the drainage in the new pot.

Do not forget that greater care must needs be taken of Ferns in pots than under any other kind of culture; and for the reason that in so small and confined a space they are more helpless than in other positions—as when in the ground, for instance—more exposed to excesses of heat and drought, and more dependent, therefore, in every way upon the watchful care of the cultivator. They must be kept constantly and regularly moist, not dry at one time and drenched at another. The saucers, too, in which the pots stand, should be kept free from stagnant water or other impurities. Water should be poured upon the soil in a fine misty stream, from the fine rose of a small watering-pot, so that the soil may be gradually moistened without being in any way disturbed or washed away from the roots of the Fern.

CHAPTER X.

FERNS AT HOME.

WE have seen how by very simple contrivances Ferns—almost alone of all plants in their adaptability for this purpose—can be made the most familiar of domesticated companions. We have seen how easily those who have the opportunity or can command the necessary expenditure, can create a Fern garden, of large or small extent, can have a Fern valley under glass, or a Fern house constructed upon a large or small scale, out of doors. We have seen, too, that those who have not the space for a Fern garden or for an out-of-door rockery, can at least have tiny Fern gardens in the house, in the shape of Ferns in pots.

The open pot being the in-door representation of the open garden, the glass case, or the glass-covered pot, is in the same way an indoor imitation of the glass house. And about the closed Fern case there is the same advantage—although on a smaller scale—possessed by the glass-covered Fern house. The most delicate, both of native and tropical Ferns, can be grown successfully in the closed case; and for the reason that the artificial covering retains around the plant the equal degree of moisture, and the peculiar stillness of the atmosphere, which Nature provides in the home of the most delicate of the moisture-loving family—conditions which cannot be so well imitated in any other way.

Here, then, is a source of pleasure and delight! A little

bit of the Fern world, dewy with moisture, like the rocks near the foaming cascade, green like the moss-covered side of the boulder of a moorland stream, and fresh with the scent of the moorland air, sealed up and brought to our homes; and there placed on hall or study-table, in our drawing or our dining-rooms: perched, if you will, on windows with the dreariest outlook, hanging there as a refreshing reminder of the moorland and woodland.

What are the especial contrivances by which these pleasant results can be produced? The tiny Fern house or case can be of any shape or size which the fancy or the disposable space of the cultivator will allow, subject to the requirements of the Ferns to be grown in it. It may be a 'window-garden,' or glazed case, which entirely fills up any available window space. It may be a four-sided case with a flat, a round, or a pointed roof, either standing by itself or mounted upon a plain or ornamental stand or pedestal. The case may be octagonal, or many sided, similarly mounted. It may be a plain or ornamental Fern stand, covered by a glass shade or bell-glass, or it may be a simple and unpretending red earthenware pot, covered by shade or bell-glass. The most expensive, no less than the most unpretentious taste, can be indulged in selecting the mere form of the case; but the simpler taste will be in better keeping with the exceeding beauty and gracefulness of the Ferns. As to the conditions of culture, however, Nature's teaching must be followed as closely as possible.

In Nature, for instance, Ferns are associated with stony substances. Hence, the best material for the bottom of a case—the part which has to hold the roots of the Ferns—is slate or stone, and not wood or metal. Metal, in fact, is to be avoided as being likely prejudicially to affect the plants. Wood may be used if some material, such as pitch, for instance, be employed to make it water-tight and

protect the woody surface from mildew and decay. A simple form of earth-box for the bottom of the case is best, and the depth of this trough or box will vary according to the size of the case and the required depth of soil.

There must first be drainage made, as in the case of the Fern pot, by the provision of holes in the bottom for the escape of surplus water, and by the laying in, along the bottom over the holes, of small broken crocks, or pieces of soft brick, intermingled with a few little pieces of charcoal. Upon the drainage must be placed the compost for growing the Ferns. Any form of miniature rockwork may be built up over the drainage, and the same rules must be observed for planting and watering as have already been laid down in the case of the Fern house. Ventilation should be provided also, as in the case of the Fern house, in the roof; and this may best be done by inserting a piece of perforated zinc. The glass case, or covering, which can be made to fit into the stand either in a room prepared for it, or in any other way, should open at the top, as well as at the sides, so as to admit of watering with a small hose, or the fine rose of a watering-pot, and of removing any dead fronds when necessary. The ventilating zinc-holes will preserve a better equilibrium between the temperature inside, and that immediately surrounding the case, and will prevent to a large extent the obscuration of the glass, and consequently of the Ferns by condensed vapour on the inside, caused by the contact of the colder external air with the outside surface of the glass.

In the disposition of Ferns in a case the plants must be arranged upon low or elevated surfaces, according to their natural habits, and there must be no crowding together of individuals. The cultivator, in fact, should study to imitate in miniature under glass the conditions of growth which are found successful in the open garden, or bank, or rockery.

Part III.

FERN HUNTING.

FERN HUNTING.

INTRODUCTION.

THE study of Ferns can be pursued in three different ways. It may be pursued in the chamber of a botanical recluse, with the aid of every scientific appliance, and with an abundant supply of dried plants, with their fronds, caudices, and rootlets. It may be pursued in the Fern house or garden, or over that microcosm of the Fern world, the case, or pot. Each of these ways of following this study is interesting and instructive.

There is, however, yet another way of pursuing this delightful study, and that is, in the home of the Ferns. Perhaps the severe votary of science may object to the proposal to associate Fern hunting with 'study.' It is too frequently the custom of our botanical writers to describe with painstaking minuteness only the structure and peculiarities of the organs of plants—to present to us, in short, the 'dry bones' of organography, but to tell us nothing of the *life* of plants. They give us a fragment of dried rootstock and frond or leaf, but will not provide any *colouring*, even as a background or as a framework to their picture.

By Fern hunting, we do not mean the mere search for 'botanical specimens' of Ferns, to be secured merely as an aid to the mastering of the technology of cryptogamic botany. We would have the expression to bear a much wider meaning. To the lover of Nature, it will suggest not

merely the study of the habits of Ferns—a study under its most delightful aspects, of the most graceful of the shade-and-moisture-loving inhabitants of the plant world. It will suggest abundant opportunity for the study of the general features of Nature—her mountains, her valleys, her clustering woods, with their roaring torrents, or gently murmuring streams.

CHAPTER I.

FERN HOLIDAYS.

As we commonly see plants and shrubs in our towns, we notice an absence of that exquisite freshness of aspect which they wear in their native wilds. The purest air and the most perfect soil, and absolute freedom from the deteriorating influences of town life, produce, too, a beauty and elegance of form which cannot in their full perfection be attained under other circumstances. It is thus, at any rate, that God intends Nature to be, and not to wear the deteriorated aspect which it too often does when brought into association with man.

How delightful, then, to seek the opportunity of studying Nature in her simplest, yet her most fresh and beautiful aspects? And what so likely to conduce to the most perfect enjoyment of such wanderings afield, as the association with our rambles of some definite object? The 'rural walk' through lanes—

‘O’er hills, through valleys, and by river’s brink,’

will be far more enjoyable if, for instance, it be made the occasion of a search after Ferns.

A search for Ferns as the object of a country ramble will lead people into the woods and lanes, into the combs and dells, amid rocks and waterfalls, where there is the purest air and the most beautiful scenery, and where, consequently, relaxation being of the most pleasant kind, will the more certainly benefit the health both of mind and body. The

rarest Ferns, and the greatest abundance of the more plentiful kinds, are to be found in the wildest haunts of Nature, lying in regions far away from the habitations of man. To the rich, such far-reaching rambles will be easy of attainment. But even to the poorest, there will often come opportunities for indulging to some extent in this delightful pastime ; and with a taste for Fern hunting, will naturally come a love for other of the beautiful works of creation ; and the heart will be lifted up in thankfulness to the wise Giver of all good things.

CHAPTER II.

FERN COLLECTING.

PLEASANT visions at once rise before the mind's eye ; visions of rambles among rocks on the sea-girt shore ; through winding mazes of green lanes ; through ferny hollows ; up ferny hills ; over moorland and meadow ; by the daisied margins of gurgling brooks ; by the rocky borders of a mountain stream ; into the deepest shade of spreading woods.

But here we purpose not to recapitulate the fresh delights of Fern collecting, but to give the collector such needful suggestions, and offer such careful guidance as may be of service in the practical pursuit of one of the most delightful of occupations.

With opportunities, either great or small, for seeking Ferns in their native wilds, how and when can they best be removed from the places in which they grow to the garden of the cultivator ? These are points with regard to which practical suggestions will be serviceable. And first of all as to the season for transplanting Ferns. The winter season during the prevalence of mild weather is unquestionably the most suitable time for removing them. The next best time is the early spring, just as the new fronds are about to commence their growth. But those who are not experienced collectors might at such seasons often find a difficulty in recognizing some species, because of the fact that the parts which afford the most easy means of recognition—the fronds—are dead. The evergreen species mostly retain their

fronds all the winter, and would, therefore, be easy to find. But it is not so, of course, with the deciduous species, which include the most fragile of the herbaceous kinds.

Ferns, however, are so hardy that not only in winter and early spring, but throughout spring, summer, and autumn, they can be uprooted and transplanted with but little injury, beyond perhaps the disfigurement of one or two of the growing fronds. And even this minimum of injury may be avoided by very careful handling, though should it be inflicted, the plant will not be long in supplying the place of its lost fronds.

We may look upon Fern collecting therefore as a delightful pursuit, which can be followed all the year round, and if this were not so, it would undoubtedly be deprived of half its attraction. But it must be remembered that success in removing Ferns from their habitats during the summer, more especially during the prevalence of hot weather, will more depend upon the method which is adopted and upon the care which is exercised during the operation than will be the case during the winter or early spring. If, however, necessary precautions are adopted, Ferns may, as we have said, be freely taken up *at any time*.

Where a fern-collecting tour is decided on, the collector should be provided with a small garden fork, a stout chisel, a hammer, a strong clasped knife, a trowel, and a covered basket—made either of rush or wicker—or other receptacle for carrying the Ferns. Should it be determined to hunt for very large specimens, it would be necessary to add a spade to the implements named. But in such a case special means of conveyance would need to be provided from some point, as near as possible to the locality from which the Ferns are to be taken; and indeed such conveyance would be desirable whenever Fern hunting on a large scale is to be indulged in. In an ordinary way, however, it would be found that the

implements—such as a trowel, chisel, and hammer, &c.—needed for removing from their habitats the smaller and rarer of, for instance, our native Ferns, could be conveniently carried in a small tourist's bag, slung on the back of the pedestrian collector, and in the same convenient way it would be found possible by careful packing to carry a good number of plants. Whenever possible it is desirable to take up the specimens with sufficient earth to prevent a disturbance of the roots. But in any case it is necessary that every possible portion of root should be taken up even to the ultimate fibrous rootlets; and this object can be secured by carefully digging at a safe distance round and underneath the rootstock of the plant. Nothing so much promotes the rapid recovery of a plant after removal as the exercise of great care in getting up the entire mass of roots and rootlets. It must be remembered that it has often taken the rootstock a long time to develop its network of rootlets, which as they grew have penetrated into all the surrounding interstices of the soil or rock from which the plant derives its sustenance. If, therefore, the work of months is ruthlessly undone in a moment by the thoughtless tearing up of the plant without its mass of root-feeders, it cannot be expected that the same vigour will be immediately shown under cultivation as was before exhibited. Yet many Fern collectors on getting out of the earth or rock by a sharp pull of the hand what looks to them like an entire root, are surprised and disappointed on finding that the earliest fronds thrown up under cultivation have sadly dwindled from their natural size. Even when, to all appearance, there is a sufficient mass of rootlets secured, it often happens that a considerable number are left unperceived in the earth.

Here in fact, as in everything else connected with the study of Ferns, it is Nature which should be closely copied, and if violence be done to Nature success in cultivation cannot be expected.

It is especially in the removal of the rock-loving Ferns, that the greatest violence is usually done to the plants. Most of the rock-growing species have very abundant, wiry, fibrous rootlets, which penetrate in a very remarkable way the stony interstices in the neighbourhood of the rootstock. It is often made a subject of complaint by Fern collectors, that the rock-growing species are more difficult than any others to establish under cultivation. But the difficulty arises chiefly from the circumstance which has already been alluded to. No doubt it is often a matter of difficulty to uproot the rock-loving Ferns, and it is for this work that a hammer and chisel are necessary, so that by the careful undermining and removal of the adjacent portions of rock, the crown, rootstock, and rootlets of the specimen desired may be got out unharmed. A little practice, however, if it be joined to a careful and loving study of the plant's peculiarities, will soon give the mastery in this kind of work.

Where, by the careful process recommended, Ferns are got out from their places of growth, damp moss or other moist material should be wrapped securely round their rootstocks and rootlets. In this way they can be conveniently carried to a considerable distance without any covering to the fronds, although if the air be very hot, dry, and sultry, the fronds, if intended to remain on the plant, must—especially those of the most fragile or herbaceous kinds—be kept under shelter, as they would be if put into a covered basket or other convenient, covered receptacle. In removing the larger kinds of Ferns, however, during the summer, it may often be found convenient—especially where room for putting the specimens has to be economized—to cut off all, or at least the largest of the fronds, and to wrap in moss, or keep covered merely the rootstocks and rootlets. When planted in the garden or other place of cultivation, new fronds, as we have already said, will, if under favourable conditions, speedily be thrown up to

supply the place of those removed. Where a tour is made in search of small specimens of Ferns, it is best, after wrapping moss—which is generally to be found in the neighbourhood of Ferns—around each little root, to pack together—root side by side with root—the whole of the specimens. If a moist wrapper be then placed round them, they will keep fresh for days, and even for weeks, if occasionally looked at and sprinkled with water. If a quantity of reed straw be taken with the collector on a Fern-hunting excursion, it will be possible to preserve the fronds of the larger species by putting the reeds on the ground in a line with the direction of the fronds, and rolling them round the mass of roots and tying them in that position. In this way the tops of the reeds standing out around the fronds will protect them from injury until they are safely disposed of in the garden at home. In many instances reeds may be found for this purpose near the places where the Ferns are growing. In collecting the rock-loving species of Ferns, it is desirable, when possible, to detach a little portion of the rock, so as to avoid tearing off the rootlets of the plant.

One important object in Fern collecting should always be kept in mind. Before removing a plant from its home, the soil in which it is growing, its position as to shade or shelter, and the manner in which it has fastened itself to sloping bank, to tree-fork, or to rifted rock, should be carefully noted; and the cultivator should then endeavour as nearly as possible to provide similar conditions of growth under cultivation. In this way many curious and beautiful lessons will be learned from the teachings of Nature.

CHAPTER III.

FROND GATHERING.

IN the compass of a small folio may be contained the delightful reminiscences of many a country ramble; the history, in short, written in colours from Nature's own pallet, of a holiday lifetime. Who would not hold such a record in his possession if he might? And all may do so. The means are at hand, and the way is plain and easily to be followed.

Frond gathering is essentially a summer pursuit. The proper season for it is, indeed, when Ferns are in the height of their glory, when they have reached to the perfection of their graceful form, are clothed with their richest of beautiful tints, and are mellow with a wealth of fruit. But we must describe in detail the process of gathering and preserving the feathery trophies of the stream-bank and ferny lane. Search should be made for the most perfect specimens of the fronds it is intended to preserve, and such a search will require great care and attention. If there be a broken stipes, rachis, or pinnule; if there be any unnatural discoloration of the frond or injury by insects, such a specimen must be rejected. It is essential, too, that a frond to be gathered for preservation should be completely unrolled, so that every pinna, pinnule, and lobe should be unfolded into its most perfect state of growth. When possible, the time for taking the frond should be just before the final ripening of the fructification. If the latter be fully ripe the spore cases will burst in the process of drying, and will not be so interesting

as objects of study when transferred to the folio after preservation. As there are varying periods of the year for the arriving at maturity of the fructification of different Ferns, it would not of course be possible in one tour extending over a limited space to gather all at the same stage. But by collecting throughout the summer and autumn during successive years, whenever the opportunity occurs, a complete collection of fronds, secured at the right season of growth, could be obtained. But as objects of beauty to the collector fronds grown to their full size, with or without their fructification, will always be an acquisition to the Fern portfolio.

And now as to the manner of collecting and preserving fronds, and the aids to be employed in the process. First of all it must be borne in mind that the object of the collector is to preserve the colour and entire form of the frond in a dry state. On starting, therefore, on a frond-gathering expedition it is necessary to go provided with a quantity of thick absorbent paper in large single sheets. The best for the purpose is botanical drying paper, of which there are several kinds manufactured. The object of its preparation is to exclude any chemical substances which may act injuriously on the colouring of the fronds. The supply of this paper to be taken on a collecting tour must depend on the number of fronds to be secured. It will be desirable, however, not to attempt to get too many at one time. Fifty single sheets, of about eighteen inches long by twelve wide, will perhaps be as many as can be conveniently carried. The size mentioned is suggested as sufficiently large to include average-sized specimens of most of our native Ferns. For the larger kinds a larger-sized paper can be used, although for convenience in carrying and in arranging in the portfolio or herbarium it will be better to take portions only of large fronds. The sheets of botanical paper should all be cut to one size and secured between a couple of boards of the same size.

Two strong leather buckle-straps to keep boards and paper compactly together will be necessary, and a third strap passed under the other two at the edges of the boards and buckled will answer the purpose of a handle by which to carry this temporary press and collecting-case in one.

When the first frond is taken the boards must be opened and one of them laid flat on the ground and covered by a couple of sheets of the paper. On this the frond should be laid after being cut from the rootstock at the base of the stipes. Upon it should be placed the remainder of the sheets, beginning at the apex of the frond, holding the superincumbent sheets in the left hand, the left wrist keeping them down whilst the right hand—as the whole length of the sheet is being lowered—is employed, with the aid of a small stiff brush or pointed stick, in adjusting the pinnae and pinnules of the frond in a manner to prevent any crumpling, doubling down, or bending under of their parts. So soon as the entire frond has been satisfactorily laid out, the second board should be put upon the pile and the straps secured, though not too tightly, in case there should have been an accidental doubling under of pinna or pinnule. As other fronds are successively secured, the same process must be gone over again, care being taken in undoing the boards not to disturb the fronds already secured, and to allow at least two sheets of paper between each specimen. So soon as the collecting boards are full, the next proceeding is to arrange the fronds at home for the first stage of pressing. They should accordingly, as they are taken from the case, be carefully examined in order to remedy any little disarrangement of their parts. This can easily be done whilst the latter are green and pliant by the aid of the brush or pointed stick already recommended. A small magnifying glass held in the left hand will be found a useful aid in this work of properly arranging the fronds, especially of the smaller kinds of Ferns,

the disarrangement in the parts of which cannot sometimes be readily seen by the unaided eye.

A fresh set of drying sheets should now be used, the fronds laid carefully upon them—two or three sheets of paper between each—and the whole—enclosed in the boards—put under moderate pressure in a copying or other press, or in a press extemporized by using two smooth but thick and heavy boards and some heavy weights. At the end of a short period—say the next day—the fronds should again be removed, placed once more, after rectifying any accidental disarrangement of parts, between fresh sheets of paper—the old sheets as disused being dried for subsequent use—and put into the press for another day. This process should be continued a few times until the fronds are thoroughly dry. The period will depend upon the kind of fronds, and their more or less succulent or herbaceous character. On a journey where a press cannot be easily extemporized, a substitute can be provided beforehand in the shape of a couple of very thick and heavy boards of oak or elm, with cross-pieces, dovetailed at each end to keep them from warping, and very thick and strong leather buckle-straps.

From the press the transfer to the portfolio is an easy process. And here arrangement must be left in a great measure to the taste of the collector. A few suggestions may, however, be of service. When Ferns have two kinds of fronds—barren and fruitful, specimens of each should be obtained, and it is desirable to have two specimens of the fronds of every species, so that front and back may be shown side by side, the front being generally distinguished by greater depth and richness of colouring, whilst the back has its arrangement of spore-cases and their coverings. The order of arranging the fronds should be according to genera, and in a portfolio, provided with guards, and containing stout sheets of white paper. The specimens should be lightly

fastened to the paper by means of threads passing over the stipes or rachis and secured at the back of the sheet. In this way they may be preserved for years, and the collection will become doubly an object of interest if to each specimen is attached a label bearing not only its name, but the place where it was gathered, together with the date of gathering.

Often in turning over the leaves of such a collection will sweet odours be exhaled, like the scent of new-mown hay or the breath of a country lane.

Part IV.

SOME RAMBLES THROUGH FERNLAND.



SOME RAMBLES THROUGH FERNLAND.

INTRODUCTION.

IN the succeeding pages the author has given his impressions of some of the lovely scenery of Devonshire, the veritable paradise of the Fern lover. The descriptions chiefly relate to the north of Devon, and are in some sense a continuation of those contained in 'The Fern Paradise.' They were written on the occasion of a tour made from Glenthorne to Clovelly, and extended to some of the fascinating regions lying to the south-east of Dartmoor. The author has not attempted to give a complete description of his journey, but has merely noted some of the scenes which appeared to him to be amongst the most beautiful in a county where, however, all is so beautiful that it has been a difficult task to make a selection.

Perhaps no better or more pleasant route to the north coast of Devon can be found than that by way of Watchet, Minehead, and Porlock. If a start be made from some point on the Great Western line, you change carriages at Taunton—

'What ear so empty is that hath not heard the sound
Of Taunton's fruitful Deane, not match'd by any ground?'—

and just beyond the town the line branches to Watchet

and Minehead. The scenery along this route to the north-west Somersetshire coast is not striking; but it has a quiet pastoral beauty of its own. About half-way between Taunton and Watchet, however, it manifestly improves, and assumes a somewhat bolder character, the improvement continuing as you follow the route into Devon. On the whole, however, there is a great and striking contrast between the scenery of Somerset and of Devon. Somerset is pretty, and quiet, and pastoral. The landscapes wear an aspect of peace and calm, and the cattle grazing along the meadows seem to have an air in keeping with this especial aspect of the country. Somersetshire, however, except on the borders of Devon, is not romantic. It has few bold hills. Its slopes are gentle, and its scenery generally does not present any bold contrasts. From Watchet the Great Western line takes a sharp turn to the west, and by way of Blue Anchor—whence a pretty peep of the sea can be had and of the Welsh coast, dimly defined on the opposite side of the Bristol Channel—goes on to Minehead, a quiet, straggling, clean-looking little place, half town, half village, calmly reposing on the sea shore.

From Minehead, the lover of natural scenery will prefer, in selecting the route to Porlock, to take the bridle path across the highlands overlooking the sea, instead of the less interesting, though beautiful, coach road. The road from Minehead to these highlands is somewhat steep, but from the highest point, immediately above the town, it gently winds over the hills, sinking and rising as you proceed onwards. Away on the left rise the dark brown hills of Exmoor. On the right rolls the sea, at the feet of rounded bluffs, sweeping symmetrically down to the water level. Strikingly pretty is the view you get, as, on terminating the hilly route, you come in sight of Porlock. The route we followed on our tour—there was a choice of bridle paths and we selected

the wildest—took us on to the summit of a steep hill clothed with gorse and Bracken. Below us, on the left, lay Porlock, calmly nestling down in a cultivated hollow by the sea, fronted by a foreland of green meadows which half girdled the shingly beach.

Following the road from Porlock, a short distance along by way of the weir, a turning to the left leads inland for a short distance, but soon again bends round towards the sea; and following it you come upon a narrow path which skirts a ridge of wooded bluffs. A wooded hill rises above you on the left, and on the right the sea is seen through a fringe of green shrubs. Presently its blue expanse opens out below, whilst straight in front is a perspective of wooded bluffs stretching gently out seawards. Then the path descends by a sudden dip into the delightful little combe of Culbone.

Wandering over the hills from Culbone, on our way to Glenthorne, we got entangled in the maze of Exmoor, but presently we struck upon the head of the glen, at the mouth of which lies Glenthorne. Down this glen, in a deep bed almost entirely concealed by gracefully waving Fern fronds and overhanging shrubs, flows a tiny stream, making its way with a pleasant hissing sound to the sea. We followed the course of this stream for perhaps a quarter of a mile, and then just over the trees we got a first glimpse of Glenthorne. Proudly at this spot, where the glen divides Somerset from Devon, does the last-named county assert her scenic pre-eminence. The sun, at the close of a glorious July day, was just setting behind a great bank of fleecy, silvery clouds, as we reached Glenthorne. On our left, across the Fern-fringed bank of the stream which ran down the combe, rose a hill densely clothed with waving Bracken. On our right another hill, steeply sloping, and sparsely but picturesquely covered with clumps of gorse and Brake. Away below, at the combe

mouth, nestling down by the sea, lay Glenthorne House. Above it, on the left, rose a steep hill partially wood covered, whilst a hillock clothed with purple heather sloped upwards on the right ; the blue sea lying between, fringed by the distant line of the Welsh coast.

CHAPTER I.

DOWN A COMBE TO THE SEA.

WE had taken a hurried peep at Glenthorne as it was settling down to repose, bathed in the dying splendour of the sunset; had followed the bewildering paths which led like a maze around the hills that shut in the combe, and had hoped (weary though we were at the close of a long journey from Porlock) that we might reach Lynton ere nightfall. But the Countisbury Inn, midway, was too suggestive of the rest which we needed to make it possible to resist the temptation to spend the night in the quiet of the little hamlet which nestles near the top of Countisbury Hill. We had no cause to regret our choice of a resting-place; for wandering out and around Countisbury in the early morning we lighted on a most charming combe running down to the sea.

The entrance to this combe had the appearance of a deep gully, and we were tempted to explore it, because of the sudden wealth of ferny forms which it displayed. Along its bed a stream ran murmuring down. Its sides were clothed with a rich profusion of the light green golden fronds of the exquisitely scented Mountain Buckler Fern, with tall forms of Bracken, and with *Blechnum spicant* in its greatest depth of glossy green. Intermingled with these were the shuttlecock shapes of *Lastrea filix-mas*, and many a form of the graceful Lady Fern. The gully sides, fringed on their tops by groups of the Broad and of the Mountain Buckler Fern, were of red sandstone earth, the vivid colouring of

which, shown in strong relief against deep green patches of clustering moss, imparted a singular element of beauty to the whole scene. After wandering a little way along the course of the stream we reached a spot where another combe, musical also with murmuring water, and running obliquely towards the one we were exploring, merged its course in the latter; the two streams commingled forming a greater breadth of running water, making a sound like the music of a little torrent, and filling the air with a volume of soft vapours. The luxuriance of Fern life at this spot was singularly great. *Lastrea montana*, with fronds fully four feet in length, spread around their delicious fragrance. On one large plant of *Lastrea filix-mas* we counted a clustering mass of sixty glorious fronds, whilst great Bracken, more than two yards long, spread their graceful feathery tops over the whole.

Looking down the combe as it descends to the sea, the hills are seen to rise higher and higher, their sides now densely and darkly clothed with fronds of the Brake, now lightened by golden-flowered gorse and purple heather blossoms, and now by soft mossy turf. Anon, as if to contrast with its delightful verdure—the graceful clothing of Fern, and the bright colours of gorse and heather—the hill becomes bare and shows its stony side. But rarely in these charming combes does a whole hill-side rise gaunt and bare; for gorse, heather, and Fern gain a footing in some moist spot, relieving the scene from the harsh and rugged aspect of barren uniformity.

Just as we round the hill-side on our right, we light upon a small grassy plateau at the junction of the streams, offering a tempting resting-place from which to look down at the charming scene lying below us. From this point of view to the point where the twin streams join and mingle their waters in one rich chorus of sound, there is a fall in the bank to the depth of some twenty feet. We cannot see the rush-

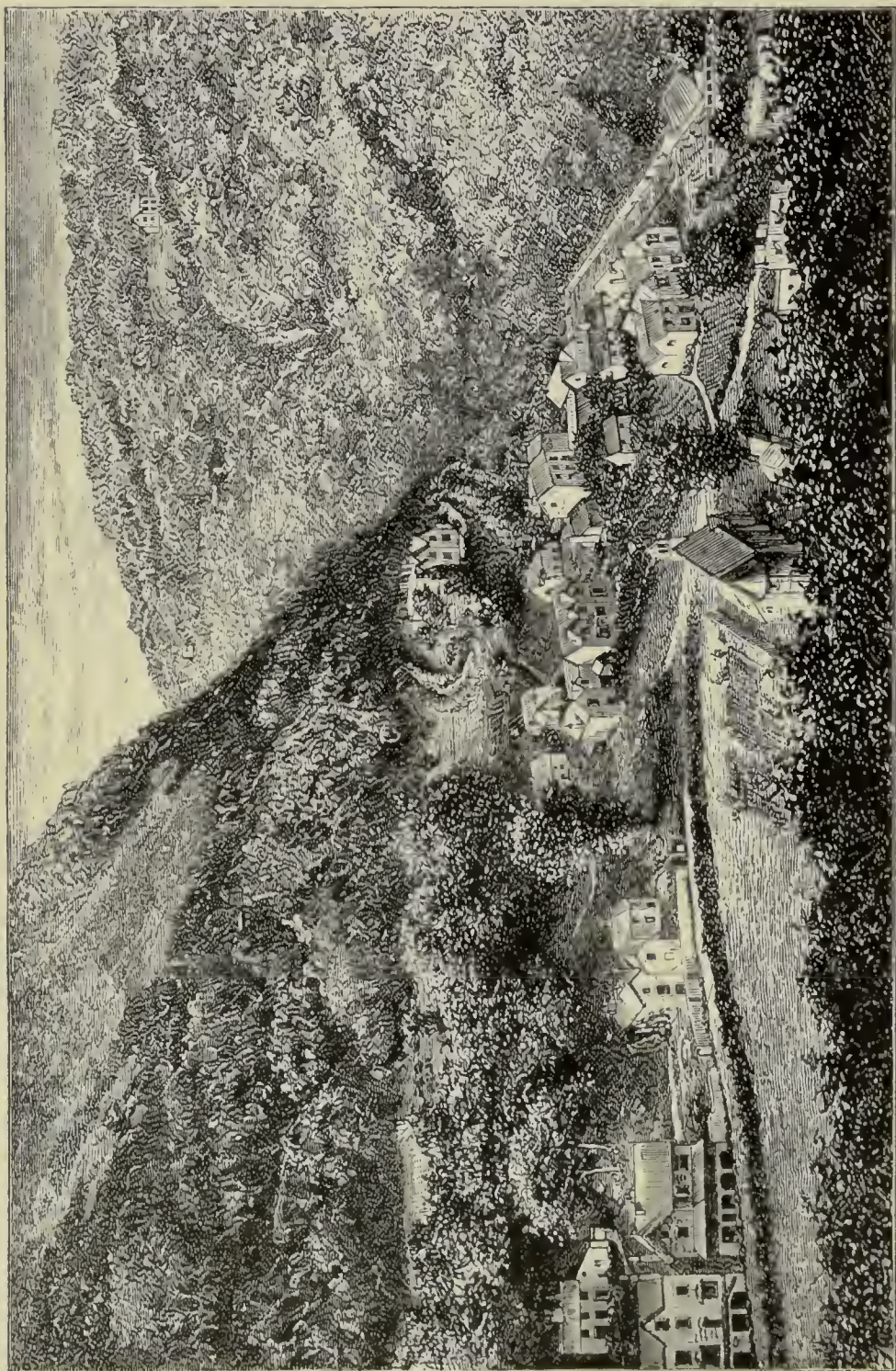
ing waters as they gently speed towards each other, for the stream banks are densely covered with Fern and shrub, which hang over from side to side and meet midway. Here are Brake, Lady Fern, and *Lastreas*—*filiæ-mas* and *montana*,—the latter with fronds five feet long, mingled in sweet confusion, and revelling in the shade created by the friendly shelter of tall shrubs overarching them, and in the soft humidity occasioned and maintained by the splashing current of murmuring water underneath. Lifting, for one moment, the eye from this enchanting ferny stream, and looking down the combe, we sight the soft blue of the sea, bounded, away in the distance, by the Welsh coast line.

The stream flowing onwards and downwards meanders in marvellous fashion; now tumbling down in tiny cascades as its bed makes a sudden drop; now hissing and foaming as the murmuring, down-flowing current is pent by stones which block up its channel. Anon, for a moment, it assumes its peaceful, uninterrupted flow, but the next it is precipitated in a shimmering, sparkling sheet, over long, moss-covered stones, its smooth and silvery surface flashing with the reflected sunlight which dances upon it.

We follow with loving persistence its downward flow, each moment receiving new pleasure from the ever-changing aspect of its murmuring course. Now the water bubbles quietly and peacefully by Fern-and-flower-fringed banks which rapidly undulate; now rising above the stream, now falling until the stream edge almost kisses the grassy tops of the level turf. For a moment the rival charms of the streamside arrest the eye from following the placid onflow of the water, and fix it on purple clumps of heather, on graceful Fern and golden gorse, on the rich colours of thistle and foxglove, and wild flowers innumerable.

Truly the soul of a man who could not feel enthusiasm over such lovely scenes as these must indeed be dead!

Dreamily one wanders on, feeling in its true fulness, in such a place, the luxury of mere existence. The soft and musically-monotonous murmur of the stream adds a piquancy to one's enjoyment at the sight of moss-green turf, of Fern, gorse, and heather. But now the gentle hiss of the stream is changed to a soft roar as again it falls in one dazzling sheet of resplendent crystal over big moss-covered stones. Turning for a moment to look at the shimmering current, as its louder voice has caught the ear, we espy, peeping out modestly from the drier side of the mossy stones, a little plant, whose purple stem and shining dark green fronds, tell us it can be no other than the Maidenhair Spleenwort. On again goes our stream, and then for a moment it parts in gentle rills, which again unite into one, as, with a steep run for some twenty yards, and a roar, it bounds over the cliff at the bottom of the combe into the sea.



“The wooded cliffside descends swiftly to Lynmouth, reposing snugly at the head of its shingle beach.”

CHAPTER II.

THE VALLEYS OF THE LYN.

WE got our first peep of the fascinating region which lies along the course of the Lyn from the towering heights of Countisbury Hill. Above, the blue sky is dappled with fleecy clouds. Away to the west lies Lynton, resting on mid-cliff over the sea, its clustering houses forming the foreground of a delightful network of green fields and hedgerows, yet reposing at the base of hills rising above and around, covered also with a network of field and hedgerow. Below Lynton the wooded cliffside descends swiftly to Lynmouth, reposing snugly at the head of its shingle beach. Over the bluffs that rise on the seaboard above Lynton the eye follows the jutting headlands which stretch away to Combe Martin. On all the sun shines gloriously, lending richer colour to the golden green of the meadows and to the deeper green of the trees, sparkling from the moving sea, and increasing the silvery whiteness of the fleecy clouds that lay banked above the highest hill-tops.

Turning our eyes inland, towards the south, we gaze upon an expanse of field and hedgerow, backed by rolling moorland. To the north and east stretches the sea between us, and the white sands of the Welsh coast. The azure of the sky, heightened by the clearness of the air, lends an intenser shade of blue to the waves, the intensity of colour being deepened where the shadows of light cloud-banks fall across the water.

Descending from the hill, on the road to Lynmouth, a turning to our left, a short distance from the little village of Countisbury, takes us to Watersmeet, that part of the Lyn Valley where the Brendon River joins the stream of the East Lyn. Standing at the point where the waters blend, one feels almost overwhelmed by the grandeur of the scene, surrounded as we are on all sides by a rare combination of natural beauty. Above and behind us screening trees shut out the sunlight, and almost exclude the blue sky. In front the last of the chain of hills which divides the valleys of the East Lyn and the Brendon Water rises steeply against the sky, clothed on all sides with a dense growth of trees, which come down to meet both streams, ending in a point at the junction of the waters. Here is a cluster of moss-covered stones, which kiss the rushing streams as they blend. On our right is the stream of the East Lyn; on our left the Brendon Water. Of each we can see only a short reach, a few yards in length. The curve of the dividing hill in front of and above us hides the further course of the stream from view. Tumbling and foaming over the mossy stones in its shallow and winding bed, the Brendon Water rolls noisily to the point of junction, and to the hiss of the watery impact is added the sound of rushing, falling waters on the right, where, within a space of some seventy yards, the stream of the East Lyn is broken into three cascades ere it reaches the point at which the twin waters commingle.

No art could adequately represent such a combination of loveliness as here meets the eye. The scene is a creation of dreamy wonder and delight such as Nature alone can produce. Let us move a little to the right of the spot where we were standing, to get a peep at both streams. In a line with the stream of the East Lyn, huge moss-covered stones tempt us to seat ourselves. We have said that for some seventy yards only can the course of the stream be seen.

Beyond, a leafy screen of overhanging trees bounds the view, and from either stream bank projecting branches make a green and shadowy vista. Away at the end of this lovely vista, high up against the screen of branches which impedes the further view of the stream's course, the water appears to drop out of the greenwood, falling thence in a shimmering cascade, which hisses into white foam as it meets the water below. For a few feet only the water flows translucently on, and then it rolls swiftly over a long fall into the pool below. The next instant the volume of water impinges against a grassy, moss-and-Fern-covered islet, and is parted into two streams, which momentarily disappear from our sight, and then reappear in twin cascades, which on each side of the mossy islet roll down on to a level bed of mossy boulders. Hissing and roaring into cream-white foam amongst these stones for a few moments, the current collects once more into a rolling stream, but the next instant is again precipitated lower still over mossy boulders, which peep above the water-level. From this point, for a few yards, the current, foaming and troubled, eddies on in a glossy, shining stream, only rippling as it flows over its stony bed, until at Watersmeet it foams again, and the united waters hiss and roar as in one channel they wind away to Lynmouth.

From Watersmeet we follow the path which, on mid-hill, leads away along the bank of Brendon Water. We pass under the shelter of overarched trees. Away on the opposite side rises gloriously the densely-wooded hill which terminates the chain dividing the Brendon Water from the East Lyn. On our left, above our path, the hill-side to the hill-top is thickly wooded. Down away to our right, in the depths of the ravine at the bottom of the sloping bank above which we are walking, we hear the roar of the stream foaming onwards and downwards towards Watersmeet. In a few moments more, as we follow on under the shelter of overhanging trees,

the bank on our right falls almost sheer to the river below, trees growing out from its steep, grassy, mossy, and Fern-covered bank. On the opposite bank of the river the hill-side is bared in one place of its trees by a huge rock, from the crannies of which grow many a Fern and shrub. The top of the rock is crowned by trees, above which rise the densely wood-covered sides of the hill.

As we pursue our path, and a bend in the course of the stream below us hides its further course from view, we appear for a moment surrounded by a great amphitheatre of wooded hills, densely clothed with their dress of glorious trees, except where, on our left, a rocky place in the hill-side is bared of all vegetation, and the surface of the rock—split and shivered into thousands of fragments—contrasts picturesquely with the dark green mantle of the hill-sides around, and with the white foam of the river on our right, where the rushing water roars along in its bed of huge boulders. From this point our path for a moment descends, until it runs almost parallel with the river level; and here, for some forty or fifty yards, the stream flows calmly along what is, for that distance, its nearly level bed.

On still, winding ever, our path again ascends the hill-side, and just where it rises, the stream on the right—its level course once more roughly broken—becomes completely overhung by trees, and it is only by peering in and down between the branches that we can see the white foam of the roaring water. Looking across the narrow glen at this spot, the scene appears supremely beautiful, as our eyes are carried upwards from the boulder-bed of the roaring, foaming stream, to the glorious wood-crowned hill which rises against the sky. As we follow on our way, the path slightly descends, and the scene changes enchantingly. Fronting us the trees rise up as on the side of an amphitheatre, and over them golden fleecy clouds float in the sky.

Away on the right, and slightly below us, the stream falls, as its course for a moment broadens, in a foaming cascade. The next moment, as our path descends, we creep under the shelter of great and glorious masses of trees, losing sight of the sky, and seeming to penetrate into the inner recesses of the glorious woodland, where the very sounds of bird and insect life are hushed, as if soothed by the dimness of the leafy shade; where the river itself, which erewhile was foaming in eager fury over the bold obstructions in its bed, now rolls, with subdued force, along, whilst its roar is changed into a murmur, as if in graceful recognition of the presence of the ferny forms which droop over the sloping, grassy, and sheltered bank.

But the charms of this woodland walk along the glen of the Brendon Water are not yet exhausted. From the quiet of the woodland shade we emerge again into the sunlight. And now a gentle stream trickles across our path; now a small rapid, hurrying swiftly down from the hill on our left, hisses along through the narrow channel which is carried under our path to meet the river below us on the right; now gently sloping ferny banks run down and kiss the water's edge, whilst ferny hill-sides rise above us. Anon the glen widens, and on our left a whole hill-side is covered with clustering Brake, whilst from the right of our path to the river's surface a ferny bank slopes down to the stream, above which rises a lofty, wood-crowned hill.

We leave the valley of the Brendon Water at Ashford; cross the stream to the Rockford Inn, and thence follow on through lanes for about a mile and a half, until we meet the East Lyn. From this point the distance is about four miles to Lynmouth; and during the whole of the way the scenery is enchanting. Our road at first winds along the bottom of the glen. On our left rises a wood-covered hill, at the foot of which runs the road to Lynmouth. On our extreme right

the glen is shut in by another wood-crowned hill, along the base of which rolls the East Lyn, winding, falling, foaming, and roaring over its great moss-covered boulders on its way to the sea. Between us and the river's edge runs an open, grassy, ferny bank. As we follow the route to Lynmouth, the river now recedes away to our right, behind a small thicket of trees, and then winds round to meet us again, being only separated from us by a Bracken-covered bank.

Now there is a rapid fall in the river, whilst our road at the same time ascends, and we pass slate-rock banks on our left, their surface bare in places, but topped picturesquely with moss and Brake, grass, ivy, and wild flowers in varying hues of purple and yellow, pink and white. Away above these flowery tufts the hill is clothed with graceful clusters of tall and waving Bracken, some waving freely in the wind on the open hill-side, others snugly ensconced under the shelter of tall shrubs. On the opposite side of our path the river bank, sloping downwards, is covered with intermingled fronds of Lady Fern, Male Fern, and Brake, overtopping the tall, thin grass. A dense thicket of oaks overshadows this bank, the branches of the trees next the river being flung across the stream, where they mingle their twigs with those of the trees on the opposite bank. Under the shadow of twisted twigs the stream roars and splashes, foaming still over mossy boulders, some so big as to form mossy islets ornamented with graceful Fern fronds. Above the river's brink the woody hill rises steeply to the sky, speckled with misty clouds.

As the stream falls lower—shining brightly where the glinting sun-rays peep in through the branches overhead, and then foaming and roaring as it seethes and boils in its bed below—its bank also falls more steeply to the water's edge, where lies a grassy plateau with a great wealth of Brake. On the left of our path, too, the shelving slate-rock

bank is adorned with giant forms of graceful Bracken, topping the gnarled and twisted roots of trees, and lending their elegant forms to enhance the beauty of the scene.

Down, down, more steeply falls in its steep bed the river on our right, bordered on our side with ferny banks which slope down to it. Mossy boulder islets are scattered in mid-stream, and above, steeply rising still, the wood ascends from the water's edge to the hill-top. Now, on our left, the banks which skirt the road are topped with purple heather, which beautifully contrasts with the green fronds of waving Bracken behind it. The river on our right sinks deeper in its roaring bed, where it is, from the path we are following, almost hid from view under the dark overshadowing of the trees on each bank. We can hear the roar and catch sight, through the interstices of leafy branches, of the foaming water. Now our road slightly descends, but the river at the foot of steeply sloping banks, dotted by charming Ferns perched shuttlecock fashion on their sides, falls lower still. Darker now are the shadows thrown on the stream by overhanging trees. Yet lower and lower falls the bed of the stream. But the sound of its roar is hushed as it comes through a tangled mass of twigs, limbs, and leaves. A little further on and the stream is completely hidden from view by the impenetrable curtain of green; and we hear nothing but the sound of rushing water to indicate its course.

For some little way our path on the left is bordered with huge rocks, ornamented by purple heather and waving Brake, and small shuttlecock shapes of Ferns gracefully peeping out of moist crevices. Above these rocks the steep banks are studded with mossy and ivy-covered clumps, and overhung with shrubs and waving Brake, whilst above rises the precipitous hill-side.

The Lyn below us, as we follow its unseen course, still

roars through the mass of branches overhanging it; the long shelving bank, which from our path reaches down to it, being covered with oak and ash. All along the route we have been describing, the hill, rising from the stream bank, has continued densely clothed with trees. But at this particular spot it soars higher still towards the sky, and the sensation is one of keen enjoyment and wondrous delight as the eye is lifted from the deep ravine to the top of the woody height which stands out in majestic relief against the clear sky. A few steps further on and we come upon a rare combination of woodland scenery. Fringing the path on our right are trees whose topmost branches overlap each other, but leave some gaps through which you can look at the bosky sea formed of the tops of the trees, which on the lower ground of the sloping river bank stretch away to the water below, from which comes a musical roar as the stream hurries down the glen on its course to the sea. The eye for a moment delightedly rests on the cool and verdant expanse. Then it follows the uninterrupted sea of green away higher, and higher, and higher over the trees, until the hill-top ends the view.

If we turn again for a moment to the opposite side of our path, the scene, though different, is charming still, for the steep rocky bank is studded with many a mossy clump and graceful waving Fern.

Winding on still, this glorious glen widens out into new beauty. Our path curves round to the right and is lost from view just where to the left it winds again. At the point where it disappears a solitary tree stands out like a sentinel, and we can just see the commencement of a narrow path which leads down over the long sloping, shrub-covered bank to the brink of the Lyn, now far down below us. We stand in sight of Watersmeet, but the meeting of the waters is hidden under an impenetrable curtain of trees lying below

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and away to our left like a great sea of green. Opposite us the wooded hill which rises from the hidden course of the Lyn soars beautifully and majestically up against the sky. But away to the left it gradually sinks, giving, beyond, the prospect of a beautiful hilly vista, in the background of which a bleak and rugged hill contrasts with the leafy charms of all around. For some distance along the course we have been following, the Lyn has been hidden by an impenetrable overgrowth of trees. But away to the left, just where the glen bends round and hides its further course from view, the stream appears again for a few yards, the foam of the current, as it boils over the big stones in its bed, beautifully contrasting with the darker body of the stream, with the waving sea of green leaves around, and with the intense blue of the sky. Away below, where the steeply sloping bank runs down to the water, and just in the depth of the ravine, a house is charmingly perched, the whole of it hid from view except its pointed slate roof, which we can see peeping out from its green surroundings. At this point it is that the waters of the Brendon River and the East Lyn meet. Here also the two glens unite and blend into a deep gorge, which with the river at its bottom runs down to Lynmouth.

As from this point our road winds round to the left, the prospect is magnificent. Right below us, on the river side, the bank falls almost sheer to the level of the roaring stream. The bottom of the glen is here broadened, but the Lyn is almost entirely concealed from view by trees which overshadow its banks, for through the dense and glorious mass of green formed by the tangled tree tops we can see only the white foam of the water. Above the whole the wood-covered hill rises almost perpendicularly to the sky, its side densely clothed, except in places where bare patches are strewn with splintered fragments of stone.

Behind the spot where we stand looking down below at the river flowing through its deep and wooded gorge, a cliff, forming the base of the rocky hill in our rear, rises straight above us, and almost overhangs the road, which from this point, as we follow it towards Lynmouth, descends a little, fringed by rocks, as the hill on our left sinks almost to the level of these rocks. Then for some distance the road is level, and presently takes a bold sweep round to the right. Below us still the Lyn roars along its bed towards the sea, whilst the steeply-sloping bank which sweeps down to it is densely clothed with tree, furze, Fern, and heather. On the opposite side the hill, still wrapped in its mantle of woods, rises against the sky.

Now on our left the hill again rises steeply, its side dotted with trees, Ferns, and shrubs, except in places where the green turf appears, uncovered by any larger growths. Now on our right we pass an old oak-tree, hanging almost horizontally over the stream bank, which now slopes steeply and now less steeply, Fern-covered to the river below; still unseen, but with ceaseless roar hurrying on in its course. The almost perpendicular heights on the left of our path are here thickly clothed with the tall fronds of waving Bracken. Just at this spot, far below us, we can see for a moment, as we pass on, the white foam of the rushing stream at the bottom of the steeply-sloping bank. But onwards for some distance the watercourse is again hidden under its dark overgrowth of trees. Presently, however, the stream once more bursts into sight, but is again immediately hidden under spreading trees, the wood-mantled hill above still rising grandly to the sky. At this spot huge rocks rise out near the hill-top on the right of the Lyn. The hill is furze-covered, except below, where it is softly turfed. From our path the river banks here run down so

steeply to the water as to have necessitated the erection of a wall, which protects the precipitous edge. A little further on a stream drops out from the rocky hill on our left, which now, winding round a rocky corner, begins to descend towards Lynmouth. On our right, rolling along in its boulder bed at the foot of the steep banks, which fall sheer to the water, is the Lyn, its clear stream boiling in foam over the rocks which block up its course. Now for some distance the stream brawls along through a wider channel, falling, foam-crested, over blocks of mossy stone, some of the boulders rising high and dry above the water. Studded here and there in mid-stream are tiny green islets covered with trees. Still winding and twining along between the hilly sides of the valley rolls the Lyn. On our left, starting up from the wayside are furze and Fern-crowned rocks—Male Fern spreading out shuttlecock fashion from moist crannies, whilst on the right of the road, and to the left of the river, is a grassy plateau almost level with the stream, studded with Fern and huge blocks of stone.

After two or three more turnings in our charming road—the river meanwhile continuing in company with us to travel along on its boulder-strewn bed—we come, on rounding a sharp point in our route, in sight of Lynton, its houses resting on the crest of the hill that rises up away in front, and appears to traverse and terminate the valley through which we have been rambling. Below the houses the hill is beautifully wooded, its base descending to the extreme point, where, by the river bed, the glen terminates. Just at this spot some houses lying at the foot of the wood-crowned hill are enchantingly perched on the banks of the river, their gardens stretching down to the verge of the brawling, foaming, boulder-strewn stream.

Entering Lynmouth, the central point of attraction for the lover of Ferns, is Glen-Lyn, the whole of which is enclosed and

in private hands. At the head of this enchanting glen,—where vegetation enjoys indeed a rare and glorious association with clustered rocks, and dashing water,—the West Lyn falls over a great rock, jutting out like a little table-land from moss, Fern-and-ivy-covered rocky ridges, which rising above it shut it in on all sides save one. The spreading foliage of trees above, rooted between the great rocky masses, casts the whole scene into shadow. Below the rocky platform where the Lyn, from its higher level above and beyond, hurls its impetuous torrent, lies a deep pool into which the sweep of water, broken into three cascades, comes with a great roar, and is the next moment flung in one volume over another rocky precipice. From this point the Lyn roars down its steep and rugged glen to the sea in a succession of the most beautiful falls over huge mossy boulders, studded with marvellously developed forms of Fern life. Now as we follow down this enchanting valley, there is a sudden dip in the course of the river, and the rapid onflow of the current precipitates its waters in one great volume into the channel below. Now, as passing under the shelter of over-arching trees, we come upon a spot where the river bed falls more gently in its course, the flow of the current, less rapid, becomes more musical, and we look in wonder upon a fairy, dreamy scene of clustering ferny forms in fascinating association with mossy rocks and flowing water. Anon, as the thickening foliage of screening trees blots out the sunlight, the river bed meanwhile again making a rapid descent, we come in continuing the path down the glen upon a spot which is the very night of dreamland. We almost forget that the sun high above the leafy canopy which enshrouds us in a dense mantle of green, is brightly shining; for in the dimness of a kind of verdant twilight we can barely see what is opened up before us—a whirl of foam-white water dashing wildly upon rocky masses of every shape, weirdly scattered



“ We look in wonder upon a fairy, dreamy scene of clustering ferny for ns in fascinating association
with mossy rocks and flowing water.”

as by a giant hand along the river bed. On both sides of the glen the wood-crowned hills which bound it rise gloriously against the sky. Towering above the hill on the right as we look seawards, is a gigantic mass of rock, its top and a portion of its side clothed with a green mantle of Fern, gorse, grass, and green shrub. On each side the hills sweep gracefully and grandly down to the bed of the foaming Lyn. Away below where they appear to meet is the boulder-strewn beach of Lynmouth. And beyond, with its fairy freight of white sails, calmly rolls the sea, the hills of Wales stretching across as the distant boundary of the horizon, and appearing like a faint line drawn across from side to side of the hills which bound Glen Lyn.

CHAPTER III.

THE VALLEY OF THE ROCKS.

A STEEP and winding path leads from Lynmouth below the cliff to Lynton above. We follow, as the more breezy and pleasant route, the cliff-side path—cut on mid-cliff—leading from Lynton to the Valley of the Rocks. The path at first winds round to the left, and soon after leaving Lynton the cliff scenery becomes wild and romantic. Above us on our left great masses of rock jut out from the steeply-sloping surface of the cliff; and as we advance, the cliff wears a wilder aspect as the jutting masses of rock become bigger, until the huge rocky excrescences appear to culminate in one gigantic beetling mass, which, from its great height, frowns at the sea below. The side of the cliff beneath us, from our path to the sea, soon also begins to bristle with jagged points of rock, the interstices of which are, however, filled with soft, green turf. As we proceed the path bends round to the left, the cliff both above and below us becoming jagged and fearful. Then we pass on our right another great pile of jagged cliffs falling steeply to the sea, succeeded at its termination by a steep bank, covered in places by turf, and strewn with large fragments of rock, at the base of which the waves foam and fret.

Turning round again to the left, the path leads down from the cliff to the quiet-looking and romantic Valley of the Rocks, or rather as it should be more appropriately called, the valley between the rocks. The name gives one who has

not seen this part of Devonshire the impression that the scene presented by this valley is wild and rugged ; whereas the valley itself has very much of the peculiar softness and grace which generally characterize the charming scenery of Devonshire.

The bottom of the valley, through which a smooth and level road is cut, is densely clothed with dark green Brake, interspersed with green patches of smooth and velvety turf ; and scattered here and there, as if by some volcanic agency long years ago, large fragments of stone. Bounding the north or seaward side of the valley are piled up great masses of rock, the huge pile known as the Castle Rock standing in the centre or midway between the ends of the valley. Between each pile of rock are long banks sloping rapidly to the sea. The southern side of the valley is bounded by a ridge, extending semicircularly along the landward side. In places this ridge is densely covered with the clustering Bracken ; in others, softly turfed ; in others again, bare, hard, and stony, with large fragments of rock jutting out from its surface.

CHAPTER IV.

CLOVELLY.

EIGHT miles of charming Devonshire scenery lie between Bideford and the entrance to the carriage-way called the 'Hobby Drive,' which, on the right, leads out from the high road to Clovelly. Keen, indeed, is the enjoyment of the tourist who takes this route in the early morning of a hot summer's day! The remembrance of the noontide heat makes the dewy coolness of the early morning all the more refreshing. The weather could not have been more glorious than it was when, early in the morning of a July day, we left Bideford by the mail-cart for the gem of North Devon—enchanted Clovelly.

We are soon away from Bideford, hurrying along in the direction of the seaward side of the kind of peninsula which is formed by the waters of Bideford Bay on one side, and the river Torridge on the other. Now, as we near the bay, its blue waters are hidden by a wood which we pass on our right. But we have soon got beyond it, and the calm blue water again comes within our line of vision. We are not long in reaching the wayside village of Fairy Cross, with its cottages straggling along the road. The road becomes steep, but its hedge-banks are steeper, and we lose for a few moments the glorious landscape. But above us is still the blue sky, and the hedge-banks on each side of us are rich in leafiness. The horses pant with the effort to climb the hill, as the ascent becomes yet steeper. But now the hedges to right

and to left become lower and lower, and open up to our delighted gaze the valley which we have just left below us, with hedge, wood, meadow, and corn-field. Now, as we reach the crest of the hill, we have accomplished a four-miles run from Bideford; and as our road winds slightly to the right, again the misty view of the soft blue sea bursts upon us. Away beyond, gently-sloping corn-fields, and wood and tree and hedge. Below us, on our left, lies a bosky valley, the dark green of the woods beautifully contrasting with the lighter and brighter green of the meadows seen away over undulating corn-fields. Beyond and above the bosky valley a church spire calmly rises in the midst of its quiet parish of a few clustering houses.

Now from the hill-top we traverse a long descent to the valley below, and halt at the straggling village of Hoops, its white-walled cottages prettily contrasting with their dark brown thatch, and charmingly fronted with fruit and flower gardens, containing fuchsias, roses, pinks, stocks, and geraniums. We stop at the door of the rustic inn—in and post-office in one—fronted also with full-blown fuchsias in their red or light pink colour. How picturesquely and simply are the gardens arranged in this little spot! now shut off from the high road by a wall erected with grass and tiny Fern, and many another wild growth; now parted merely by a painted fence; now close by cottage walls where fences avail not, and a tiny patch of ground has been utilized and flowers planted, the charming colours of the full-blown blossoms contrasting with the white-wash of the cottages.

Now we leave the straggling village and pass hedge-banks with a wealth of the beautiful foxglove and of hazel-nut and blackthorn bushes. Then as our road winds round to the right we get a peep of sea-cliff and blue sea away below us, and the sloping combs that run down to it. Anon we pass

the end of a green lane which also runs down to the sea between undulating meadows. Now we descry a bosky combe going down to the sea. We mount once more the hill-top, and get one more peep of the calm blue sea. Away to our right at the bottom of this hill lies Buck's Mill, and descending it we follow a level road between ferny hedges, and anon we once more sight the blue sea. We have now traversed the eight miles of road between Bideford and the Hobby. A turning from the high road on the right leads us into that most charming drive. Under overarching trees which throw the path into cool shadow, we wind round and round, descending as we go. On our right there is a sloping tree-covered bank, dotted with shuttlecock shapes of Fern; on the left a high bank richly clothed with grass and Fern, and crowned with trees which spread their fresh green branches over the road. For some little way the character of the scenery remains the same, but in a few moments we come upon a bend in the road round to the left. Turning round this bend a gap in the leafy curtain on the right affords us a prospect which compels us to pause. Away just in front as we turn to the right, two hills densely clothed with a dark mantle of trees sweep down into a combe. Their sides interlace midway, but the deepest part of the combe is hidden from view. Over the point where the hills intersect each other we get a peep of the sea. As the eye passes midway across the bosky side of the hill to the left we sight a cliff rising sheer from the sea, and in the foreground of the cliff a wooded bluff descending almost to the water's edge. As we stand on the crest of the steep bank whence this delicious peep is to be had, we hear just below us the gentle murmur and hiss of a stream of water, which is hurrying down the bed of the combe to the sea, but which is hidden from sight by a thick screen of foliage. Down goes our path as we turn from this delightful spot, and follow its course,

the ferny bank on our left meanwhile rising higher and higher. Under the shelter of its overarching trees are glorious forms of *Lastrea filix-mas*, four feet three inches in length; of Lady Ferns three inches longer; and of *Blechnum spicant*. Under the shadow of this tree-covered bank gleams of sunshine have found their way through the twisted branches, and the curling leaves are silver-tipped where the sunny gleams fall upon them. Now on our right our path passes along the crest of the bank which heads the combe, whose leafy depths lie below us. A little further on the banks on our left are covered with ferns, ivy, and wild flowers, and topped by a taller growth of trees, whilst the prospect is opened out on our right between a gap in the trees of the mouth of the bosky combe, widening as it nears the sea, whose blue surface is calmly set out below. From where we stand we can see the rippling waters. The distance, however, is too great to hear the surge. But the soft music of the murmuring stream which hisses as it tumbles down the combe below us rises deliciously to the ear.

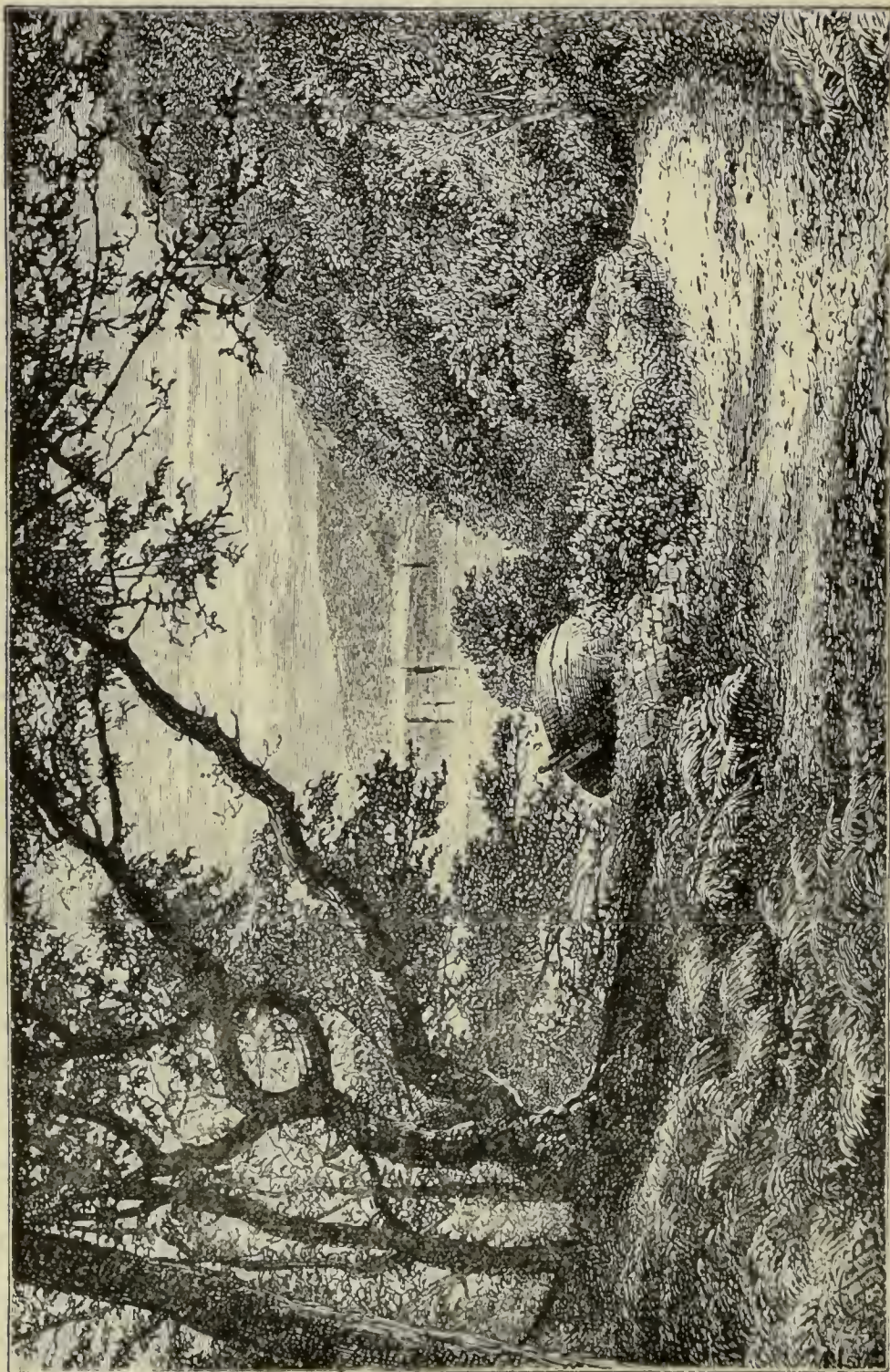
We continue our path, and as we proceed the bosky ferny hill on our left rises higher above us, whilst the bank which edges the path gets steeper, its sides of slate rock and sandstone, darkly mantled with ivy, and dotted with Fern, moss, and wild-flower. But how can pen describe the exquisite scene which lies below us on our right? A steep ferny bank densely clothed with a charming drapery of trees which screen sea and sky, hiding from sight all but tiny glimpses of both from between leafy interstices: and the sound of the hissing stream below comes to our ear filtered and softened by the intervening mass of wood, and leaf, and branch.

As the way opens out, the tops of the trees on each side of us no longer fling their branches across the path where now the sunlight is admitted. Our road then for a short

distance skirts midway the side of another combe which runs to meet the one we have been describing. Below, and running alongside of the path, another stream flows down this second combe, and, meeting the waters of the first, rolls on to the sea. Then the path bends sharply to the right, crossing a stone bridge, whose sides are clothed with moss and ivy, with creeping Polypody and little shining tufts of Hartstongue. This bridge crosses the lower bed of the combe and its hissing stream, which here gurgles along as it falls over its rough stony bottom. Turning to the right as we cross the bridge we get a peep of a pretty scene just over the bridge side. On the right and left of the stream Fern-dotted mossy banks slope down to the water, which for a few yards foams along in its bed, and then is lost from sight, under clustering Fern, leafy branch, and ivy-covered tree trunk. Crossing to the other side of the bridge, we catch a peep of the stream, where, before passing under the arch, it is formed of two separate rills, one on the left dropping out of the steeply-sloping bank, the other flowing from the opposite side, and both joining ere they reach the bridge.

Leaving the bridge, our path now bends completely round and commences to traverse the opposite side of the combe, across the stream-bed of which we have just passed. A moment more and we can peep down the course of the combe to the sea. On our left the bosky hill rises high above us, the rocky sides of its lower bank rising steeply from the road, and covered with gorse and Fern, with the dark green of the ivy-plant, and the bright flowers of deliciously-scented honeysuckle.

Winding on still we follow our charming road, which now near the mouth of the combe almost reaches the sea. Then for a moment we are constrained to pause, charmed by the exquisite loveliness, by the mingled freshness and beauty of



“Below us on our right the sea is softly murmuring on the shingle beach.”

the bosky, sloping, ferny bank on our right, beyond which, and away between leafy interstices and twisted branches, we get glimpses of the blue sea.

A ferny bank indeed! No lover of English scenery could resist the desire to linger by this spot; but for the Fern hunter, with an eye for the especial beauties of his graceful favourites, the place has exceptional charms. Nursed in the gentle shade of twisted branch and leafy stem, which gently keep the dewy moisture in close attendance upon rising crowns and freshly verdant fronds, grow some of the finest of the graceful family. The dark green fronds of *Lastrea dilatata*, the glassy fronds of *Blechnum*, vigorous forms of *Lastrea filix-mas*, and golden-green *Montana*, with Lady Ferns on Lady Ferns, both green and purple stemmed, one noble plant bearing—we counted them—a hundred and twenty charming fronds, most of them four-and-a-half feet long!

On again for some distance along a road now almost level, a tree-covered slope, descending from our feet on the right, partly screening but not hiding the blue waves of the sea: on our left a wooded, grassy, ferny bank. But now a turn in the road brings us suddenly in view of Clovelly. Away below us on our right the sea is softly murmuring on the shingle beach, its blue expanse dotted here and there with white sails. Looking across and beyond the high cliff which rises over the wooded height under which from this point Clovelly appears to nestle, Lundy Island is seen stretching its length across the sea. Now, as we go on, screening trees close over our path, and the scene changes in detail. On our left a gently sloping bank densely crowded, under its overgrowth of trees, with ferny forms. On our right also a sloping bank, now falling gently, and now steeply to the sea, and now presenting a level surface charmingly wooded and Fern dotted. Then for a moment the sea is hidden by a ferny bank on our right;

but almost immediately it again bursts on the view, seen through the leafy openings in the trees on the steep bank on our right. In a minute or two more we get a peep by the beach of two or three of the white houses of Clovelly, and we catch sight momentarily of the foreshore of its harbour. Then as our road descends, we lose sight of the little place. But it is only for a moment, for anon we come upon an opening upon our right, where an iron chair invitingly placed tempts us to be seated, and to look on the pretty little town. Charming indeed is the scene which now opens before us.

Down away below us on our left nestles a wooded glen, its sides densely clothed with a dark green mantle of trees. At the foot of this glen two bright green meadows lie, whose lighter verdure charmingly contrasts with the darker shade of the trees above them. Away in front is the tiny harbour of Clovelly, backed by its sloping beach, both calmly resting at the foot of the wooded hill, topped by a bare cliff, which rises high over it. Beyond all, the blue sea, with Lundy Island again in sight.

Turning from this spot, our road for a little distance is free from the shadow of overarching trees, and there is nothing to shelter us from the fiery glare of the July sun, save that the soft sea-breeze which gently fans us imparts a delicious coolness. Presently, however, our path winding round and descending, takes us by a rude stone bridge to the opposite side of the wooded glen we have just described.

Here are we indeed in a veritable paradise of Fern-land. Compelled to pause for a moment by the delightful sense of delicious coolness which comes over us, we take our stand upon the bridge, lean over its rude parapet and look down, attracted by the music of the flowing stream beneath, at the wealth of ivy clothing its arches—the dark green leaves of the delightful climber being relieved here and there by

glossy fronds of the lighter-coloured Hartstongue, which peep out from rootstocks nursed under the moist and congenial shelter of the ivy-trailers. We linger but a moment, however, upon this wealth of evergreen. The dreamy murmur of the stream below us, as it runs down the bottom of the ravine to the sea, rivets our attention. The sides of the ravine steeply shelve to the bed of the stream, the trees on each side of which droop forward to meet each other from opposite sides, their ivy and moss-covered branches interlacing. From each side of the stream-bank, under the moist shelter of these overhanging trees, huge ferny forms fling out their graceful fronds, and mingling with the wealth of green branches away beyond, form a vista beneath which the stream disappears, its murmur becoming less and less distinct as it melts away in the distance.

Turn we now to the opposite side of this rustic bridge, and we shall get a charming peep at a spot where Nature delightfully holds her own. In mid-stream, a few yards above the bridge, an islet is planted narrowing on each side of it the channel of the brook, whose waters, divided for a moment into two rills, unite again ere they flow under the dark arches. A charming bit of Fern-land is this same islet, formed, no doubt, by the aggregation of earthy particles arrested by a group of stones in mid-stream; but as we see it, with its ferny fronds and moss and ivy, it is one dense mass of delicious green. Snugly sheltered as it is by the protecting shadows of little trees, which in their turn are sheltered by the larger tree-growth above them, the green and graceful tops of Fern are, nevertheless, silvered by a few rays of the July sun which have coyly crept down to the stream through the overgrowth of arching branches, which in a wealth of leafiness spread themselves like a canopy between the blue sky and the glancing waters of the music-loving brook.

Leaving this charming spot, and rounding the glen which on our right opens up in all its splendour to the sea, nothing being seen but sea and wood, the two sides of the glen uniting in a point, our path rapidly descends. We cross another murmuring stream tumbling down the glen to the sea, and then we appear to be almost lost in a sylvan maze. On our right is the musical glen, on our left a hillock, steep and tree-crowned with trees of stately growth overarching ferny banks.

On we go, our road winding round and round, and down and down—giving ever-changing peeps of steep glen and ferny bank, blue sea and sky—until we come at length upon a spot, whence we appear to be looking out from a leafy heaven upon the snug little world of Clovelly lying below us, and seen only between the leafy interstices of the trees, its white-slatted and thatched houses clustering on the hillside. For a moment the place has the appearance of being buried under the trees. So much, indeed, do the trees outslant, that they appear as if they had been hewn down and thrown on to the houses.

Again, we cross a stream that flows down a little ravine right into Clovelly. We pass down on the other side of this ravine. Now our path rounds the back of the town, lying from our point of view embowered on the hill, the blue sea seen beyond in all its loveliness through the green interstices of the trees.

At the end of the road continuing the Hobby Drive towards Clovelly (the New Road is the name given to the last mile), a turn to the right leads us on to a spot whence we get a most charming peep of the cliff, along which our path has been cut. But, pursuing our road towards the romantic little town, we come into its 'High-street,' and begin to explore this singular place, the site of which has been cut out from the steep hill-side. First, the street goes straight

down by a series of paved steps. Then it winds and winds down to the beach, the houses being placed one over the other, each with its bit of garden railed off. The houses seem to adhere as by an effort to the wooded hill-side—a hill which is, in fact, so steep that it may be called a cliff. Let us begin our exploration of this singular place from the Beach.

Around the quay at Clovelly, and opposite the small breakwater which is built up to enclose its tiny harbour, small houses cluster, built on rocky foundations, which are daily washed by the tide. These houses are curiously arranged, some of them with wooden balconies, erected probably to keep children from tumbling out on to the Beach.

Turning away from the Beach in commencing our ascent through the heart of Clovelly, hung on the steep and wooded hill which rises over the sea, we enter, passing under an archway, the lower end of the High-street, corresponding to the bottom of the town. In doing this, we actually are passing bodily under the foundations of a house, which has been built on the archway in question.

And now we commence the singular ascent to 'the top of the town.' To make this ascent as easy as possible for the pedestrian, the entire road through the heart of Clovelly is not only paved with rounded stones like very big pebbles, but the whole of the way is divided into broad steps, each somewhat the shape of a parallelogram, and rising two or three inches above the other and lower one—the division, where the upper steps rise above the lower being marked by a line of larger stones. The crevices between the stones are filled with small tufts of grass, and at the end of each division below the line marked by the big stones are larger tufts of grass and weeds. Grass, too, grows along the way at the foot of the walls of the houses, which are some of brick and others of stone, and some composed partly of brick

and partly of stone. Some of the houses are perched over others, and are approached by winding-steps. Fern and grass fill the interstices between the bricks and stone. Gardens are placed in odd corners in all sorts of spaces, which exist in all kinds of almost impossible situations; and where there is no room for gardens, little spaces at the foot of the walls are utilized, where fuchsias and creepers, snapdragons, geraniums, and ivy grow.

From the quay the road winds round and round in its first ascent. Stone steps in almost every direction appear to lead everywhere—up into the houses, which would but for them be impossible of approach, down into and up into gardens placed in marvellous corners—and away into pantries and out-houses. Now on the side of the High-street a wall parts off a small enclosure which does service for a garden. In other places such enclosures are filled with high and rank weeds.

Now as our paved path winds on and up we pass under a wall built up of big stones, and topping the wall above us, and springing out over our path are long clumps of fuchsia and other garden flowers. These flowers are growing, in fact, on the level of what are the gardens above us. As we wind upwards we reach a point where our path opens up a view of the harbour and the sea beyond. At this spot, looking over the wall on our right in the direction of the sea, we catch sight of a tiny garden bright with hydrangia, sweet pea, nasturtium, and fuchsia. This garden is hung, as it were, over the wall, is no more than some six yards long and one yard wide, and is actually higher than the pointed slate roof of a house, which, from where we stand, has the appearance of clinging by its side to the cliff.

We go on winding up and up. All at once, as we are proceeding we hear the merry voices of children, appearing to come from high up in the air. Looking up whence the

voices proceed, and far above us, we see children playing in gardens that seem almost to hang over our head. A few minutes more and from the ledge where we stand, if we look across on our left we espy a cottage giddily perched right on the top of a cliff covered with ivy and shrubbery. A little further on and a turning to the right leads into a sort of paved quadrangle, which is, in fact, a little world in itself, having little flights of steps leading up to and leading down into gardens placed in every imaginable position, the houses to which they are attached respectively being so placed as to command a view of several tiers of houses lying below them.

Then after winding and turning in every possible way we at length reach once more the steep and almost straight part of the High-street, which leads away up to the top of the town.

CHAPTER V.

SEA AND SKY AND WAVING GREEN.

FEW lovers of the country will be inclined to deny that the most delightful of summer retreats are those where rich woodland and sea can be found together; and the coast of Devonshire offers an abundance of such retreats, for nearly all around the sea-border of this charming county the pure blue briny waters dash upon sandy reaches and pebbly bays, or against bold rocks, which front landscapes rich in hill and valley, green winding lane, and sparkling stream.

We found a spot which combined these attractions near Paignton, in Torbay. We were just a mile from the sea, embowered in a world of leafiness, whence we could get delightful peeps of the calm blue waters of the bay, and yet find ourselves within a few yards from our place of residence, in the midst of a most charming network of green lanes. Even our windows command much of what is beautiful around us. Here is a north window opening up a glorious prospect! But first, on throwing up the sash and looking out we are tempted to give one look at the garden which hems us in all round. And what have we here? A box-edged border forming the sober boundary to a wealth of glossy-leaved, red-blossomed fuchsias, rich-leaved laurel, blushing rose, and sweet-smelling pink, with that charming 'old-fashioned' plant, the stock; and—for the Ferns are not forgotten—the finely-cut luxuriant fronds of a noble specimen of *Polystichum angulare*, rich dark-green above and densely

clothed beneath with rust-coloured scales. By its side a goodly specimen of *Scolopendrium vulgare*, with its leathery green, shining fronds, whose simple form show in clear contrast against the elaborate markings of *Polystichum angulare*. Dividing our garden from the narrow road is an ivy-covered wall. Across this road is another wall, sheltered by shrubs, and over-shadowed by a beech and an elm, skirting a softly sloping upland, the fringe of a private park. As we peep out of our window on this northern side we can see but little of the sky because of the spreading branches of the trees which overshadow us. But we get one large patch of blue, and tiny specks of blue also, through the interstices in the trees overhead, into which golden rays of sunshine find their way, glinting through the leafy apertures and gilding the plants and shrubs in the garden. But the soft subdued light favours the noble ferny forms which grow amidst their gayer companions of the garden.

From another window of the same room, which in the early morning is bathed in sunshine, we look out upon a bed of geranium and giant fuchsia, and then upon the green turf beyond, bordered by a gravelled walk. Our border hedge is fronted by a row of laurels and laurestinas, and overshadowed by elms. Beyond the border is a peaceful meadow, surrounded by hedges shaded by tall elms. Further away still is a stretch of orchard-land rich in promise of golden fruit. Beyond again more trees and fields, with white-walled houses, and then the misty blue line of the sea, with, just in our line of vision, one white sail like a moth on the water.

Leaving the house and passing through a tiny orchard in its rear, we take a turning to the right and at once find ourselves in a green lane, overshadowed by hedges, whose sides are clothed with trailing ivy, grass, the leafy tendrils of the wild strawberry, and other trailing plants, whilst it is topped with the closely-set branches of nut-bush and hawthorn which

fling their slender limbs across our path. Under the shelter of these spreading branches, where moss grows the thickest and the tendrils of ivy are most closely clustered, lie, snugly ensconced, delightfully-green tongue-shaped fronds of the Hartstongue, together with those of the graceful *Polystichum angulare*. At intervals along the hedges on either side are tall trees—elm, and oak, and ash—which deepen the shadows in our lane, the winding course of which is hid from our view whichever way we turn. The red soil of this lane finely contrasts with the green dress of the hedge-banks, from out of which, here and there, little bright patches of the red earth peep like great rubies set in emerald.

We have followed the course of this winding lane but a few yards from our orchard gate when we come upon a little scene that fairly enchants us. A turning on our left—a tunnel through a great overhanging mass of green twigs and trees—but a tunnel uphill in which all would be dark under the dense canopy of twigs were it not that some sixty yards distant, where there is a bend round to the right, in the narrow lane, a flood of sunlight is let in over the hedge-top. But to get to this point, we must pass through this green and dense avenue, in whose dark shadows we are soon enveloped.

Here, indeed, the Hartstongues appear to reign supreme, many of them with fronds thirty-four inches in length, of that rich, dark, shining green colour which is engendered by the exceptional shade and moisture of this cool retreat. They hang down from the hedge-top in long and graceful clusters, and fringe the hedge-banks in most mature and beautiful form. There is, indeed, everything in this chosen habitat to promote their growth and the perfection of their form, for congenial shelter is afforded to their fibrous rootlets by the matted rootstocks of the larger growths of the hedge-top.

At the entrance to this tunnel of green, before the shadows deepen, the hedge-banks on each side are clothed with a trailing dress—delightful shreds of deep green grass, trailing sprays of ivy, wild rose, and blackberry, sweet wild thyme and pimpernel, tender shoots of hawthorn, produced from the berries which have fallen from the larger growth on the hedge-top, roots and leaves of primrose and wild violet, with woodbine and crowfoot. On one side a bush of holly, and above, overshadowing shrubs of hawthorn and hazel, whilst mingled with the wealth of greenery on the hedge-side are gentle fronds of the Soft Prickly Shield Fern and the green tips of *Scolopendrium*. Presently the hedge-banks get higher and steeper, and the trees which crown them come closer and closer together, forming a canopy of interlaced branches which throw all beneath them into the deepest shade. Here, by the absence of sunshine, the narrow hedge-banks lose some of their clothing of trailing shrub, but find a more congenial dress in deep-green moss. Here, too, the ivy is more at home, and from its knotted roots in the hedge-top it trails in rich profusion over the steep hedge-bank, whose mossy sides it kisses with its leaves set in their depth of bluish green. In the dark hedge-top the Hartstongue revels amidst a sheltering mass of ivy and splendid forms of *Polystichum angulare*, the latter perched in situations where their fronds can freely display their graceful shuttlecock shapes under the shelter of the over-arching foliage. Trees above the matted and canopied clothing of the hedge-top deepen the shadows around us as we stand under the lower branches of ivy-covered oak and ash, whose arms intermingle with the canopy of nut-bush and hawthorn. Intermingled again with this canopy are the far-creeping tendrils of a blackberry-bush, dropping down into the lane, and suspended in mid-air in lace-like shreds of green.

Now the hedge-banks rise higher still, whilst the shade

grows deeper, and the moss thicker. But the shade is lightened here and there by the streaks of golden sunlight which find their way through tiny interstices in the interlaced foliage above. These streams of golden light glance on the tips of green—relieving by their bright effulgence the darker shades of other leaves—and sparkle on dew-drops, which glitter like molten silver. High up on the hedge-top, revelling in the moist shade of screening shrubs, yet coquetting with the filtered sun-rays, are beautiful forms of the glossy Hartstongue and *Polystichum angulare*.

Presently we emerge from the most shady recess of this lane as the hedge-shrubs fling back for awhile their overhanging branches and let in upon us blue sky, as well as more golden sunshine. Yet in the hedge-tops Ferns still revel in the depth of scarcely diminished shadow; but on the hedge-sides, now bathed in sunshine, other wild plants compete for room with moss and Ferns.

We now take a turning round to the right as our path ascends, and as we turn the corner the hedge-top on one side is bared of sheltering shrubs, and we get a peep of sky and spotless blue, and of leafy tops of thickly-foliaged elms rising clear towards the blue sheen; and just beneath, under the sheltering arms of two of these trees, we get a tiny peep of sloping meadow, and then a perspective of wooded upland.

On still we follow the course of our lane, and as we turn the corner, passing under the spreading branches of an ivy-covered oak, we once more come into shade. Again sheltering branches of hazel and hawthorn close over us, whilst the hedge-bank below is clothed with ivy, moss, and creeper, the thorny tendrils of the dog-rose, and the pale green leaves of primrose. Amongst the moss are tiny plantations of seedling Ferns, and lace-like tendrils drop down from the shrubs

above, and touch the moss, ivy, Ferns, and creepers beneath, whilst again golden sunshine, filtered through the canopy of green, glints upon them.

Upwards and onwards still, our lane continues, now widening as it passes under arching shrub and spreading tree, and as it momentarily opens up coming under the genial influence of richer gleams of sunlight; now narrowing under deeper shade of spreading boughs, and richer depth, and greater wealth of living green; but still ascending. Now our course appears, a few yards from where we stand, to terminate in an open grassy glade, bathed in golden sunbeams. We pass to this open spot through the lingering shadows of shrub and tree; when lo! we find it is but a freak of our charming avenue, which at this point turns so abruptly round to the right as to hide its course from view from the point whence we looked at it.

But an opening on our left and a gateway in the hedge-gap tempts us to pause for a moment, to catch a peep at the beautiful outlook which this point suggests. We pass through the gateway and ascend the sloping sides of an open meadow. Arrived at its highest point we can command a charming view of land and water. Seawards nearly the whole of Torbay is opened up before our view. Looking from our stand-point to the north-east we see Paignton lying away below us, its scattered houses partly screened by trees. If we look to the right of the town, across a green extent of undulating meadows, divided by green hedges topped by tall elms, we can see the heights of Torquay—the green mantle of its hills relieved by the white sides of its scattered villas. Midway between Paignton and Torquay the line of sandstone cliffs, forming a bend in the bay, beautifully contrasts with the blue sea and with the villa-crowned hills of Torquay.

Taking now a sweeping view from north-east to north-

west, the eye will wander over a delightful stretch of meadow and tree-crowned hills, both the dark green of the trees and the lighter and brighter green of the fresh meadows being relieved by the brilliant patches of red soil. Away to the right, in an opposite direction, stretches the blue line of the sea, until it is interrupted by the altitude of the coast at Berry Head.

How beautiful an element in a landscape is sun-light—the pure effulgence of the orb of day, undiminished in its lustre by smoke or cloud! As we stand on this eminence above Torbay the sun is shining gloriously, and what a rich store of beauty and delight it adds to everything around! But a change comes slowly over the scene. As we have been gazing seawards the blue sky, erewhile spotless, is now becoming patched with great masses of foam-white cloud, which floating under the eye of the sun, deepen here and there into darker shades of green the spreading landscape, and fling their shadows on the sea, whilst the tree shadows falling on the green sward bring out into bright relief (where sunbeams fall on them) the golden green of the meadows, in whose peaceful glades cattle are quietly browsing. Nature, too, is always changing, for as we look the soft breeze which has arisen increases, and light shadows are gently flung by swiftly drifting clouds on sea, hillside, and valley, one moment dimming the lustre of their blue, and green, and gold; but the next unveiling these charming colours to the eye, giving a new aspect of their fresh delights, and inspiring in the heart a new sense of the abounding goodness of an all-wise Creator.

But to return to our green and winding lane. From the point where we left it, its course—still ascending—broadens out under a canopy of blue sky, letting in the sunshine. Then, still winding, it falls again, whilst the topmost branches of the hedges on each side of the way bend over

and almost meet, making chequered sunbeams glint through the branches, and causing leafy shadows to fall on the ground. And still the hedge-banks speak, for they are clothed with glossy fronds of Hartstongue and *Polystichum angulare*, intermingled with moss, ivy, and other creepers, and with brambles of blackberry and dog-rose. Now, on our right, another gateway gives a peep of open country—sloping meadows and hill-side, with cattle gently feeding. A few feet more, and on our left we get another peep of tree-covered hill-side and upland meadow. Then steeply down runs and winds our lane, whilst overhanging still are trees and hedge-top shrubs, nursing under the congenial shelter dog-rose and blackberry tendrils, whilst hid amongst the mass of vegetation on the hedge-bank Hartstongue fronds still peep out. In a moment more we get other peeps on our left and then on our right of meadow and upland. Passing on by mossy tree trunks and mossy stones in the hedge-bank, touched by trailing sprays of ivy, and long tender shoots of blackberry, we turn sharply round to the left, our lane now widening, whilst in front of us are hill, wood-side, and coppice. On—winding still. But now we are approaching the end of this charming lane, and the sunlight comes in in a flood, giving brilliance to the blue of the pimpernel, and to the colours of the other wild flowers which here clothe the green border of the pathway, whilst the delicious odour of thyme and wild balm come to us with the breeze which floats over the hedge on our right.

CHAPTER VI.

TORBAY.

STARTING from Paignton, and taking our way along its fine sands in a southerly direction, we soon leave the beach and follow a road which for some distance will take us up to and along the high land over the cliffs. We now have the sea on our left, and its blue waters charmingly contrast with the red of the soft sandstone cliffs in the indentations of the coast. Presently our cliff-path comes upon the carriage-road from Paignton to Goodrington, and if we follow this for a little way it will bring us down upon the fine sweep of the Goodrington Sands, locked in between opposing points of sandstone. There is a singularly quiet air of repose about this place, and it is a really fine sight to see a big sea rolling in over its smooth hard foreshore. If in our course we take the route along this bay, we must at the farther end, if we would avoid too closely following the sinuosities of the coast, turn up by a road which passes under an archway of the Torbay Railway. Immediately on the other side we take a sharp turning to the left, and follow a footpath across fields skirting the landward side of the railway. Presently we ascend a steep upland, arrived at the top of which we pause for a moment and turn round.

On our right rolls the sea. In front and below, curving lines of railway leading away to Paignton, whose houses—clustered about most densely around its red sandstone church

—lie at the foot of a meadow-and-tree-crowned hill. In front of the town stretches the golden line of its sandy bay. Beyond, the red indented line of the sandstone cliffs, blotched upon their sides with green patches of vegetation. Over these cliffs we sight the short range of hills which running from west to east, and rising and falling alternately, appear in the far east to melt into the sea. Midway on this range lie the clustered villas of Torquay, the town and pier nestling down to the water's edge, and fronted by its harbour and little fleet of sailing craft.

Pursuing our path we cross by a small bridge the Torbay Railway, and skirting this for a little way we descend again to the sea, and find ourselves in a wild and lonely cove, on whose beach are scattered great masses of split rock. At low tide the coast may here be followed for some distance under the cliffs. But the path is rough and rocky, and at times one's feet can have but an uncertain hold on the green and slippery rocks. At high tide this route cannot be followed. But on our way we came upon numerous specimens of *Asplenium marinum* nestling in moist crevices of the sandstone cliffs. It is instructive to note the particular habitats of these beautiful plants. They invariably seek the most moist and shady crevices of the rock.

In one spot on the route we are describing, we found a large number of baby plants. The cliff at this place had receded, probably worn away by the friction of the tide, for some two or three feet, so that the superincumbent mass of rock hung over the beach. The shady surface of the cliff in this natural recess was moist from the percolation through the rock of the unseen trickle of some tiny stream on the ground above; and thus a congenial habitat was formed for the spores of *Marinum*, which loves the neighbourhood of the soft sea spray, and the breath of the moisture-laden breeze, whilst its rootlets feed on the rich substance of the sandstone cliff.

Nursed in such congenial spots the tiny spore-life soon develops into the rich fulness of the glossy frond, and from its shady nook looks out upon the glancing waves.

Following our tortuous coast-line, we soon emerge upon the beautiful and appropriately named bay of Broadsands, so styled because the tide recedes a long way back, leaving a noble breadth of sandy beach. Continuing our way along this beach, we at its southern end again mount the cliff and follow the narrow coastguardsman's path for some distance—our direction being now eastwards—until we come upon Silver Cove. But there is very much to admire and enjoy between this little journey from Broadsands to Silver Cove. The jagged indented coast-line is a study in itself. The red sandstone beautifully contrasts with its own cliff-top covering of grass and Brake, of gorse and heather, with the grassy tufts mantling its sides, and with the blue sea dashing upon a beach on which lie scattered here and there rocks in rough masses, covered with their mantle of seaweed.

A lovely spot is Silver Cove. We pass across its white shingly border, and follow along under the red sandstone cliffs for some distance, clambering over huge blocks of scattered rocks, now encountering a brief patch of shingle which affords a somewhat smoother path, and now and then lighting on a tiny shingle cove. On our route we find here and there, where jutting rocks afford the favoured canopy in which the plant delights, tufts of the Sea Spleenwort.

Now at length the cliff becomes too steep, and the rough beach too rugged to permit of our pursuing our way along under the rocks. So we mount to the cliff-path of the coastguardsman, and after following it for a short distance, we find ourselves on the height overlooking Churston Cove. We descend the steep side of this cove and then through a winding path between Bracken and gorse we find ourselves

on the heights above Brixham, which in a few minutes more we reach.

A singular old town is Brixham, with its houses rising on an amphitheatre formed by the hills which rise above and around its harbour. The town of itself is scarcely one that will be admired by the lovers of the picturesque. Yet it has a picturesqueness of its own, and though it is the abode of a poor population of fisherfolk, it does not forget that it is a Devonshire town. Far away, across and above the tops of its clustered houses, a little bit of truly Devonshire scenery peeps out, meadow and tree looking down upon the hard lines of bricks and mortar below it, in their richest of verdant colouring.

We pass away from the town to the jagged point of Berry Head at the south-eastern corner of Torbay, at which, ere we change our course, we take a farewell look from the grassy top of the rugged-sided cliff which in places descends sheer to the sea.

And now we bend our steps away from Berry Head, and returning to Brixham by another road, make for Mewstone Bay, named as one of the habitats of the True Maidenhair (*Adiantum capillus-Veneris*). If we take this route to Mewstone Bay, we have to follow a winding green lane, the Hartstongue, both the normal kind and varieties with their apices cleft, peeping out at us from between the thick greenery of the hedge-banks on each side. Our lane ends at a stone stile ensconced under the protecting shelter of a spreading shrub, but it has not ended without giving us on our way from time to time peeps through gaps on the hedge-bank of the blue waters of the sea. Crossing the stile we pass into a meadow crowning the cliffs that rise above Mewstone Bay. Turning now sharply round and downwards to our left, a winding path will take us along the verge of the cliff for a short distance in the direction of Berry Head. Pursuing this cliff-

path we reach a point from which further progress is impossible. Here, however, there is a grassy sward on the giddy height of the cliff from whence we can command almost the entire length of Mewstone Bay.

A scene of rare beauty lies below and around us. On the south of the bay a hill crowned on its top with rich meadow and corn-field sloping even over its brow to the cliff-top, inclines at one point to the Channel, and at another to the verge of the red sandstone cliffs which overhang the waters of the bay, and are there covered with their green shrubbery of gorse and Brake, whilst their sides, here a dull red and there a dark hue, are freckled with a sparse mantle of green. On our right, broken cliffs of limestone, covered too with their complement of grass and gorse, slope unevenly to the beach, whose sandy and shingly surface is washed by the restless waves. If we turn and look in the opposite direction we can follow the line of rugged inlets of the coast away in the direction of Berry Head, whilst away to the east are the waters of the Channel.

A few steps from our point of view, a narrow, steep, and winding path, just wide enough for foothold, leads us down the limestone cliffs into the bay. Arrived at the bottom of our path, we turn to our left, and reach in a few minutes the south side of the bay, where the limestone cliff assumes a remarkable appearance, its base being deeply hollowed for the space of some thirty or forty feet, possibly by the slow but certain force of great sea-waves, which during rough weather roll in here with enormous power. Over this hollow base of rock the overhanging cliff frowns out threateningly, its sides forming a massive and jagged canopy of limestone slate-rock. One half, indeed, of the cliffs of Mewstone Bay, including its south corner, is limestone rock, the remaining half being red sandstone.

As we stood under this giant canopy of rock, the scene

around was peculiarly grand and wild. Strewn about the beach were huge fragments of rock, which during some terrible storms, or by the force of some convulsion of Nature, or perhaps by the slow eating away of the bonds which held them to their parent cliff, had fallen on to the strand, where they lay in terrible silence, which was broken, however, by the dull roar of the waves as they dashed heavily over the huge masses—a roar which was given back from the cavernous hollow of the cliff. Overhead the sea-gulls screamed, as they sailed safely above the din and danger of the great waves.

It was in this neighbourhood that we found our first clump of True Maidenhair. From the hill above us a stream of water trickled over the surface of the limestone rock, and whilst carefully looking about we espied a baby frond of Maidenhair, so small, that had we not looked closely into the rock, we could not have noticed it. Our 'find' suggested a further search, and, clambering up the limestone cliff by the aid of some bushes, we came upon some hardy little tufts of the beautiful plant, snugly ensconced under the projecting shelter of a spur of limestone, and revelling in the moisture and shade produced by the oozing of a tiny stream over the cliff-side.

We turn our steps away from the beautiful haunt of the Maidenhair, leave the bay, and, mounting to the high ground, find ourselves in the green mazes of a winding lane. Then we take a path on our left, which leads us again to the sea, and striking the coastguard's path, we commence a tour along one of the most charming lines of coast around the whole of lovely Devon. Our path begins to fringe the top of a glorious cliff rising far above a steep and narrow inlet of the sea. Midway above this inlet we are constrained to pause, charmed by the loveliness of the scene. In front of us, and to the south-east, as we stand and gaze outwards is the blue expanse

of the sea. Immediately below, on the right and left of the spot where we stand, rugged cliffs sweep down in the sharp angles which form the sea's inlet at this point to the shingle beach, on which lie scattered great fragments of sandstone rock.

But above the point upon which we stand a giant cliff rears its head, its steeply-sloping sides broken and jagged into curious forms, presenting a most singular surface—here bared of every growing thing, and showing a fantastic colouring of red sandstone; there covered with Brake and grass and creeping shrub, the whole surface riven into marvellous shapes, yet its indescribable wildness subdued and softened by its beautiful garment of green. Immediately below this covering of green the grassy cliff-side is smoother, but its surface again becomes broken and delved as it rolls steeply to the beach.

Our path follows the giddy edge of the cliff-top, fringed with graceful forms of Brake, the rocky surface carpeted with dark-leaved ivy, and sheltered by trailing sprays of honeysuckle and blackberry, and by the prickly branches of the sloe. We soon reach the cliff-top, and, looking back, we can desery the rugged indentations of the coast from Berry Head to Mewstone Bay, and thence to where we stand.

From this point our path keeps for some distance along the head of the cliff. Beautiful indeed is the aspect of these cliffs, their sides sweeping steeply down to the sea, now clothed with trees, now covered alone by shrubs and grass, gorse and Fern. Presently we again descend over a steep grassy slope to Mansands, which lie, shingle-bordered, at the mouth of a beautifulcombe, that, sweeping gracefully down to the sea between two hills, repose in the quiet of soft meadows divided by hedges, and sparsely covered by trees, with only one small cottage besides the coastguard station in the whole of the bay.

We skirt the bay and mount its opposite side, passing the coastguard station, and through its garden continuing our way along the coastguard path. Away on our left the slate-rock cliffs steeply shelve down to the sea, and present a grand and peculiarly striking appearance. Here the coast is much indented, the waves roaring and foaming on split fragments of rock, whilst above these the stony sides are spotted with grass, and Fern, and gorse. From the high ground above the coastguard station at Mansands our path for some distance passes along the cliffs, which are here clothed in every variety of manner with graceful Brake. Now from the path to within a few feet of the sea the cliff-side, steeply sloping, is densely clothed with graceful, waving fronds. Anon, for a little way from the path, there is a steep and precipitous descent to a level platform clothed with grass and shrubs, and then from this point the unbroken surface of Brake continues shelving to the sea. For a long way the cliff-side presents this ever-changing aspect of Bracken, which reigns almost supreme along the cliff-side. Our path, meanwhile, rises and falls, presenting an ever-changing course.

Now we approach another inlet of the sea, and our path steeply descends to the beach below us. Here for a moment the cliffs on our left rise sheer from the beach. As we descend to the latter we cross a stream, which rushes through a tiny gully with narrow sides, between rocky banks almost subterranean in appearance, and then falls hissing over the cliff-side. Not a house is to be seen in this bay, nor a single human being in its strand of beautiful shingle. We skirt the beach on its landward side, and again mount the opposite cliff, the steeply-sloping side of which is darkly and densely clothed with graceful fronds of Bracken, interspersed with gorse and heather.

Our path now lies through dense masses of Bracken, which almost close over our head as we brush between them. Wild

and beautiful almost beyond description is this cliff-side path. Now it winds midway on the sloping hill-side, whilst above and below us the Bracken are densely clustered on our left, sweeping gracefully down to the sea, and on the right side, carrying the eye away in dreamy wonder and delight over their waving tips to the hill-top. For a long distance we thus wade through a sea of Bracken, which gently rustle at the touch of the soft breeze coming to us from over the wide expanse of the ocean away below us, whilst the music of the waters reaches us like a soft and plaintive murmur, filtered as the sound is through the dwarf forest of waving green which covers the gracefully-sloping cliff-side.

Yet, wild and grand as is the combination of ocean and sky with the wide-reaching and unbroken sea of Brake on the steep cliff-side, there is no monotony in the coast-line, which is ever changing as we follow the coastguard path. Now for a moment the soft character of the cliff is altered as we near an inlet and sight some jagged rocks, which, though rugged, nevertheless are imbued with a softness which relieves their wild aspect, for clinging to their sides there is sure to be some fringe of green. Then we light on a combe and descend to its bottom; and jagged cliff, weirdly graceful Brake, roaring sea, and rocky mass over which the waves foam and fret, are lost sight of, whilst the eye delightedly surveys the peaceful aspect of sloping meadows and waving trees, canopied by the calm blue sky, softly decked with the silver of its fleecy clouds.

We had wandered thus to within two miles of Kingswear, when we followed a path across country which led us on to the head of a lane that presents a most singular yet most beautiful appearance. For fully half a mile it appears almost to descend into the earth, the path down it being cut somewhat in the fashion of stairs out of the rocky hill-side, whilst overhead arching branches fling their arms, forming a

green canopy of tree and shrub. So steeply did this lane descend that in going down it we could not preserve an even pace, but had to go down in a sort of shambling fashion. At the bottom of this charming lane our path crosses the head of a most lovely combe, covered by meadow and corn land, with tree and shrub starting up picturesquely from the dividing hedges, the whole landscape forming the rolling background of the sea, lying away to our left, at the combe mouth.

Now we come in sight of Dartmouth and the glorious Dart, and our path lies under a dark avenue of trees, which line the way on both sides of us. Now it mounts a hill, and then it goes down, down, still under the deep shade of trees, whilst trees away and down to our left clothe the precipitous bank of the river's brink. Then, continuing our path, we in a few moments reach Kingswear.

CHAPTER VII.

THE SOUTH-EAST COAST OF DEVON.

ONE can so often *look up* at the towns of Devon, because they so frequently are hung on its hill-sides. One of the finest views of Dartmouth, for instance, can be had from mid-river on the ferry passage from Kingswear. From this point let us note the features of this charming town, whose houses cluster chiefly along the edge of its harbour, but are scattered also against the side of the hill which runs along above the town. Away to the left of the latter—we are facing its harbour with our back to Kingswear—the scattered villas on the hill-side are embowered in trees, but higher on the hill no villa breaks the continuity of spreading wood. Looking down towards the river's mouth, a hill running from right to left shuts out the sight of the harbour-mouth.

Leaving the town, and following the course of the Dart, we pass mid-way along the hill which runs to the sea. Above us, are detached villas delightfully surrounded by gardens. Below us, villas also, with garden grounds descending to the river. Presently our path descends and winds along an arm of the Dart on our left; then creeps along the foot of the hill which runs out towards the river in the direction of the mouth of the harbour. As we pursue our path it presently slightly rises, keeping, however, along the foot of the wood-crowned hill on the right. Then it creeps under the shelter of trees. Here and there, picturesque houses are placed along the river-bank just below

us on our left, their gardens touching the edge of the stream, whose blue, mirror-like surface reflects the shadows of the trees and shrubs flanking these river-side gardens. Now we pass away from the houses, but still we can see the blue water of the Dart through the leafy interstices of the trees which fringe the river's brink. Then there is an opening in the trees, and we can peep out on a charming bit of scenery—the river below calmly flowing into the sea, whilst across on the Kingswear side the wooded cliffs present a noble and grand appearance. Then, at length, passing the church, we emerge hard by the ruins of Old Dartmouth Castle. Here the mouth of the harbour comes out on the open sea, which spreads away in the distance until it is bounded by the faint blue line of the horizon. Close by on our right, as we stand and look seawards, a wood-crowned ivy-covered cliff that rears its head above us, descends sheer to the water's edge. Down beneath, scattered over the wild bit of beach which nestles thus at the foot of the frowning cliff, great fallen masses of rock lie strewn, some of them covered by the sea, and others just peeping out of the tide.

Some steps cut in the rock lead us up to the summit of the ivy-covered cliff, and thence a winding path takes us along a meadow over the crest of a hill which commands a beautiful view of the harbour-mouth. Across, on the Kingswear side, the steep cliff that bounds the sea is wooded down to within a few feet of the water's edge, and crowned with undulating meadows. The mouth of the river widens out gracefully and symmetrically to the sea. On both sides the basin of the harbour is formed of rounded hills, which sweep gracefully down to the rocky bases against which the waves roar. Clustered trees hang on the cliff-side as the course of the river disappears from view, round a bend of the hill on the left, in the direction of Dartmouth. Away from our feet, the meadow on which we stand sweeps roundly down to the crest

of the cliffs which there overhang the sea, the sound of which from the height at which we stand comes to us with a gently-sighing cadence. The soft and peaceful aspect of the scene is deepened and rendered more impressive by the presence of houses, picturesquely placed here and there on the hill-side. There is, indeed, a fascinating beauty in the whole scene, as we pause and fondly and lingeringly gaze upon it. Blue sea and sky, green undulating fields and waving trees, the distant sail upon the water, the murmur of the restless sea, and the soft touch of the gentle breeze. Yet, softly cadenced as is the sound of the waves to our ear as we stand far above them, their foaming crests as they fall against yonder cliffs tell of a mighty force of impact.

A few steps more, and a bend in our meadow-path brings us in sight of the long jutting line of the coast which ends at Start Point, surmounted by its lighthouse. After following this path for some little distance along the crest of the meadow, it leads us into a lane which winds along up and down for some distance. Now we are shut into the lane, and can see nothing but the sky overhead; now a gap in the hedge-bank gives us a glimpse of the blue sea lying calmly stretched out below us, its bosom here and there spotted by a white sail. Now we pass on our left a small fir copse, and sight the blue waves between the interstices of the branches. Then from our high ground we descend a lane with high ferny banks, and pause a moment as the lane suddenly opens out to the left. We lean against this wall as we look over its top to catch a peep of a lovely combe, which lies nestling below it.

Our path follows round the bend of this combe, and then winds up and on through a ferny lane for a little way, until it abuts on the high road to Stoke Fleming. We turn to the left into the road, pass through the village of Stoke Fleming, and, arrived on the other side, we descend again

towards Wherrington Cove, with its beautiful curve of smooth, hard sand, on which the snowy-topped waves are breaking. This cove forms the mouth of a charming combe, on the sides of which green meadows calmly lie, sweeping down to the tree-covered bottom.

The indented coast-line continues but for a short distance beyond the further side of this beautiful little bay—meadow-crowned hills sloping roundly to the summit of the short cliffs which there overhang the sea. Then, just beyond this bit of coast, commences the long sweep of the Slapton Sands, which run at the feet of gently sloping hills crowned by soft meadows, bounded by their lines of hedges. At the feet of these hills, and at the centre of this long sweeping bay, separated by a narrow road from the beach, lies the expanse of Slapton Lea, which, from our stand-point, looks like a silver streak at the foot of the hills. Straight across to the south-west, and at the farthest extremity of Slapton Sands, we see the small white cluster of houses which mark the position of Torcross. The aspect of the coast at this point is extremely peaceful, the hills from Torcross sinking until they appear to drop into the sea at Start Point.

CHAPTER VIII.

THE HOME OF THE SEA FERN.

AMONGST the boldest and grandest of the coast scenery of Devon, is the wild, uninhabited, and we may really say almost unknown region which extends from Portlemouth to Prawle Point, the southernmost extremity of the county. To reach Portlemouth we took a cross-country course from Torcross, mounting the steep hill behind it and then proceeding along the high table-land to South Poole. It was late in the afternoon when we left the Torcross Hotel, and we had gone but a little distance when the last faint glimmer of day sank behind the hills. For miles we pursued our way in the darkness, lighted only by the faint glitter of the stars. But the depth of the shadows which fell upon our path was relieved here and there by the lights of the glowworms which crept forth in their mimic brilliance along the bushes on both sides of the road. Wearily we approached our journey's end for that day at South Poole, in whose little inn we passed the night.

The sun shone out brilliantly as early the next morning we took our way along the picturesque bank of the Kingsbridge Water, on the opposite side of which we soon sighted Salcombe. Skirting the higher edge of Portlemouth we made over the point of coast which commences the line from Kingsbridge Creek to Prawle Point. Calling to get a draught of milk at a farmhouse on our line of route, we passed through a kind of water-lane, the stony sides of which were

in places absolutely crowded with plants of the beautiful *Asplenium lanceolatum*. Thence across some fields we made for the terrific but beautiful coast, in search of *Asplenium marinum* which we had been assured grew in splendid luxuriance along the sheltered rocks in this neighbourhood.

We were not long in reaching the top of a steep inlet of the sea. But the cliffs reared up almost perpendicularly, and appeared to forbid the possibility of access to the wild beach which lay far down below. With some difficulty, however, and at some risk we clambered down the rocky sides of the solitary chasm, and made our way on to the rugged beach which was wildly strewn with great masses of rock over which the boiling waters of the sea broke in fury. We had indeed reached the home of the sea Fern: for on the first glance around we espied under the moist shelter of a great mass of rock just above our head, a splendid specimen of *Marinum* with fronds fully twelve inches long, hanging down in a great and shining mass of purple stem and leafy glossy green.

For some distance we made our way along this terrible but beautiful shore, terrible to the hapless bark which might be flung on to it in the wild rage of a south-westerly gale, but beautiful to those who love to see Nature in her grandest aspects. Above, steep, jagged, precipitous cliffs; below, fallen rocks of every form and shape, strewn wildly upon the savage beach, and meeting sternly and immovably the heavy roll of the sea, which comes in with a sullen roar, and is broken into a dozen reverberations as wave after wave finds its way in amongst the rocky masses of the foreshore. Now against a solid front of rock the incoming wave comes with a swinging 'crash,' and the liquid missile hurled against the stony surface flies far into the air in ten thousand points of snow-white foam. Now there is a dull roar, followed by a succession of mournful echoes as a great wave rolls into a

cavernous hollow in the cliff. In one of these, where the incoming waves sped through a huge channel—formed between two great masses of almost perpendicular rock,—we espied growing beyond the tide-mark, but just within reach of the finest spray of the waves, a noble specimen of *Marinum*, its roots embedded in the veins of rock and its fronds hanging down, as if to meet the fresh onset of the sea. But we encountered in all directions abundance of these beautiful plants, sometimes perched boldly on a cleft of rock, which lay under the shelter of a larger rock above, sometimes ensconced in the hollows formed by two masses of superincumbent rock, and sometimes clinging to the side of the open cliff in places where trickling moisture came oozing down from the height above.

Presently we found that our progress along this rugged beach was no longer possible, for giant masses of rock lay right in our path, too precipitous to climb, and too steep to round on the seaward side. We therefore once more sought the high ground over the cliff-top, along which the coast-guard path took us for a considerable distance. A hill rose above us on our left like a great ridge, its side and top presenting a peculiarly wild appearance, strewn in some places as they were by great masses of contorted rock, whilst in others the surface of the ground was covered by waving Brake, purple heather, and golden gorse. Here we found in great abundance many fine plants of *Asplenium lanceolatum*, ensconced under the shady projections of the hillside rocks. In places where a mass of rock was piled up in a conglomerate heap, forming a variety of dark, moist, and shady recesses, these beautiful Ferns would be found growing in the greatest luxuriance, their pinnules having the peculiar crisped or curled appearance which is characteristic of *Lanceolatum*.

But perhaps the most beautiful part of this singularly wild and beautiful coast was that which lay between the

coast we have just described and Prawle Point. We marvelled indeed that the railway which so quickly opens up the most beautiful parts of our beautiful island had not long since been brought to this charming part of the coast of Devon. We passed a succession of the most lovely bays, which would make the most delightful of seaside retreats; now fronted by strips of golden sand, as smooth as velvet to the touch; now by a stretch of snow-white pebbles; now by shingle of varying hue. Studded along the foreshore and partly covered by the sea were scattered about great masses of rock, on which the sea-fowl perched, and around which the waves foamed and boiled. In places the tiny strips of beach were unapproachable from the cliff-top, which rose sheer above them to a vast height. At one particular spot to which we were led by following the coastguard path, we stood for a few moments, and gazed down a terrible precipice which suddenly yawned away below us. It was formed by two projecting points of cliff, which spread out in horseshoe shape, approaching each other at their seaward extremity, and forming what might be almost likened to a huge well in their rear. Terrible indeed was this chasm, the jagged walls of which down far, far below appeared covered in places with a film of green which we knew must be the wild rough grass which is so often seen growing on sandy soil. Looking down the giddy height, we espied across and below on a jutting point of rock what looked like a small white stone. As we looked, however, the object appeared to move, and then, by the aid of a glass we found that it was a sheep grazing on the cliff-side. The white gulls skimming in mid-air below us looked like butterflies, and down farther still the sea, whose roar we could not hear, except in a faint sigh, showed its fringe of snowy foam, as it broke upon the desolate rocks and spread itself over the golden sand.

It is probably due to the ruggedness of many parts of

this wild coast that the beautiful Sea Spleenwort flourishes there in such great luxuriance. The shady clefts of rock and dripping caves, though offering a congenial home to this Fern, are too difficult, though not impossible, of access to admit of many visits from any except the most enthusiastic of Fern hunters. Hence for years the flora of this shore remains undisturbed, and the botanical adventurer is content with the luxuriance of the earliest found of his favourites. We ourselves did not explore along this coast to the extent we could have desired had time permitted. None know better than the naturalist how quickly the hours pass in the delightful work of exploring a coast unvisited before; how much to study and admire is found, and how slow is progress. The wilder and more rocky the coast, too, the more difficult is progression, and even at the end of a long summer's day, devoted to such a work of discovery and examination, but a small extent of coast can be compassed. A week might well be spent in an exploration of the two or three miles of coast between Portlemouth and Prawle Point, and the Fern gatherer would find a world of pleasure in examining the charming nooks of that home of the Sea Fern.

Part C.

BRITISH FERNS: THEIR DESCRIPTION,
DISTRIBUTION, AND CULTURE.

INDEX TO PLATE 1.*

FRONDS UNROLLING.

FIG. 1. SOFT PRICKLY SHIELD FERN

[*Polystichum angulare*]

2. MALE FERN

[*Lastrea filix-mas*]

3 & 3a. BROAD BUCKLER FERN

[*Lastrea dilatata*]

4. HARTSTONGUE (SMALL FROND)

[*Scolopendrium vulgare*]

5. LADY FERN

[*Athyrium filix-femina*]

6. HARTSTONGUE (SMALL ROOT WITH FRONDS UNROLLING)

[*Scolopendrium vulgare*]7. LADY FERN (PORTION OF CROWN OF ROOTSTOCK WITH FRONDS
UNROLLING)[*Athyrium filix-femina*]

8. PRICKLY-TOOTHED BUCKLER FERN (SMALL FROND UNROLLING)

[*Lastrea spinulosa*]

9. BRITTLE BLADDER FERN

[*Cystopteris fragilis*]

10. HAY-SCENTED BUCKLER FERN (SMALL FROND UNROLLING)

[*Lastrea recurva*]

* The INDEX at the end of the volume will include the pages where the coloured plates and the letterpress description of each species of Fern will be found.



BRITISH FERNS.

INTRODUCTION.

THE Author desires, in this section of his book, to introduce to his readers by actual representation as well as by verbal description, those beautiful members of the Fern family which are natives of the British Islands, but which, though natives of Britain, are nevertheless, many of them, distributed throughout Europe, America, Asia, Africa, and the Islands of the seas.

If he were to attempt, in describing British Ferns, to give to each species, the various and contradictory names assigned to them by different botanical writers, or were to enter into any discussion concerning the multitudinous reasons—founded upon the theories, to a large extent purely fanciful, of particular writers—for including certain species in or excluding them from this or that genus, he might easily occupy the whole space contained in this volume, to the exclusion of everything else which fills its pages; and in the end he probably would only have succeeded in confusing the minds of his readers.

What the Author has sought to do is to make the British species of Ferns known as dear and familiar friends; so that they may become to those who read the following pages a living and loving memory. At the same time he is not to be understood as implying any disparagement of a scientific classification. In fact, appended to the ordinary English

name of each Fern will be found its most commonly-accepted scientific name. But against this will, however, be placed an explanation of its particular significance—an explanation which will generally be found to furnish a reason for its selection.

To what it is hoped may prove to be a popular and sufficiently clear description of each species of Fern inhabiting Britain will be added an explanation of the positions, and a list of the localities in which it grows, and a series of cultural notes.

Where species are grouped, the grouping will be arranged according to the most natural features of resemblance, and this arrangement will be found to accord very nearly with what the Author believes to be the most sensible system of classification adopted by botanists.

It would be foreign to the purpose of the present volume to attempt to include within its pages a descriptive list of the immense number of variations from the normal forms of British species. Nothing perhaps has tended more effectually to discourage the study of Ferns than the publication of volumes whose pages have been overloaded with a mass of dry, and to the ordinary reader utterly incomprehensible descriptions of variations in the species, all of which have been labelled with Latin names—some of them extending to a length of more than forty letters. Of one of the most familiar of British Ferns—the common Hartstongue—lists have, for instance, been printed, in which five hundred variations from the normal form of the species have been enumerated. We forbear to give the number of *letters* which the nomenclature of these varieties has called into requisition. But the mere designation of the entire number has necessitated the use of *nearly sixteen hundred* Latin words.

What has been attempted in the following pages is a careful and exhaustive description of the normal forms of

every British species of Fern—the variations from which are in reality but monstrosities of a more or less constant and pronounced kind—together with an equally careful and exhaustive description of the habitats of these species. The search for varieties will be a curious and interesting pursuit for the lover of Ferns. But probably few of those who are not prepared to give up a lifetime to the study of the subject will care to burden their memories with more details relating to our native Ferns than those included within the succeeding chapters. When the eye is familiarized with the natural forms of the British species, little, if any, difficulty will be experienced in recognizing the departures from those forms.

Under the head of ‘Distribution’ in each of the following descriptions the habitats of our British Ferns have been given. In the case of the more plentiful species, the counties in which they occur have alone been indicated. The particular localities where the rarer kinds have been obtained are mentioned. To give a complete list of the habitats of every Fern would have necessitated far more space than could possibly be devoted to this part of the subject in any volume of moderate size. But in the majority of instances there is no necessity for such a list. Indeed half the pleasure of ‘Fern hunting’ would be gone if the actual spots where the plants can be found were always indicated. The attraction of this delightful pastime consists in a very large degree in the loving search for plant forms, and in the surprise and pleasure which are occasioned when this loving search is rewarded by a ‘find.’

The Author indeed desires above all things that the following descriptions may call up before the minds of his readers not only the living realities of the plants described, but at the same time, by a natural association of ideas, glimpses of the beautiful natural world of whose verdant clothing they constitute so charming and so graceful a portion.

INDEX TO PLATE 2.

FIG. 1. BRACKEN (PINNA OF FROND WITH PORTION OF RACHIS)

[*Pteris aquilina*]

X 2. HARTSTONGUE (UPPER SIDE OF FROND)

[*Scolopendrium vulgare*]

3. HARTSTONGUE (UNDER SIDE OF FROND)

4. HARD FERN (BARREN FROND)

[*Blechnum spicant*]

5. HARD FERN (FERTILE FROND)



THE BRACKEN.

Pteris aquilina.

PLATE 2, FIG. 1, PAGE 185.

THE most familiar form amongst the inhabitants of the Fern world naturally claims the foremost place in these chapters of descriptive enumeration. There are probably very few people who can say that they have never seen a Fern of any kind. Those who have had but little opportunity of visiting the country, and can with difficulty indicate their hazy impression of the points of difference between flowerless and flowering plants, will perhaps attempt to shield themselves from a suspicion of entire ignorance of the subject by describing how and under what circumstances they saw what they believed to be 'Ferns.' If further inquiry be made, it will generally be found that the 'Ferns' thus seen are 'the common Brakes,' or Bracken; on some hilly slope; by the margin of an open stream; under the shelter of a little wood, or upon the undulating surface of some wide extending common—briefly noted, perhaps, during a hurried journey, or during the short leisure of a holiday ramble.

DESCRIPTION.—The botanical name of the Bracken conveys some idea of the form and habit of this Fern: for it might be freely translated as 'Eagle's-wing.' *Pteris* is from the Greek *pteron*, a wing or feather: *aquilina* from the Latin *aquila*, an eagle. The generic name might apply to most Ferns, on account of their feathery appearance, but it has an

especially appropriate application to the Bracken if taken in connexion with its specific name, and understood to indicate the most noble forms of this plant. But another explanation of the specific designation *aquilina* has been offered. If the lower portion of the stipes of the Bracken be cut transversely, a figure will be seen in the centre of the stem, by some persons likened—and very naturally so—to a miniature oak tree, but by others to a spread eagle, or to the German double eagle. We prefer the more picturesque—if more fanciful—designation of ‘Eagle’s-wing.’ The Bracken attains a length, varying according to favourable or other conditions of growth, of from one foot to ten or twelve. It is a deciduous species, the fronds disappearing on the approach of winter. They spring from various parts of a rhizoma, black in colour, succulent in texture, and velvety to the touch, and having an extensively creeping habit. It creeps mostly a few inches only underneath the surface of the soil, but sometimes has been known to grow at a depth of fifteen feet below the surface. The rhizoma varies in thickness from that of a small goose-quill to a finger of the hand, and is provided with somewhat thick and fleshy rootlets. The fronds—of the length already described—are more or less divided according to the circumstances of their growth. In shape they are somewhat triangular. Large specimens are tri-pinnate, or three times divided. The stipes—dark in colour under the ground and green above—is a little more than half the length of the frond. The rachides, both primary and secondary, are smooth or roundish on their under surface, but grooved on the upper surface or at the front of the frond. On each side of the primary rachis the branches or pinnæ are arranged in pairs—each nearly opposite the other—of an oblong egg-shape, near the base of the frond, and tapering as they approach its apex. Arranged in opposite pairs along on each side of the pinnæ are lance-

shaped pinnules broadest at their bases, and attached to the pinnæ by short stems. The pinnules nearest to the main rachis are again divided, in luxuriant specimens, into oblong blunt-pointed lobes, which, however, towards the apices of the pinnules, are merged into the substance of the latter. The fronds, pinnæ, and pinnules are always less divided towards their apices than at their bases. One curious and characteristic exception to this must however be noted. On each pinna the pair of pinnules nearest the main rachis of the frond is generally dwarfed—the pinnule on the upper side of the mid-rib of the pinna being the smaller of the pair, so small sometimes as to consist merely of an undivided blunt-pointed leaflet—and sometimes absent. Small and stunted specimens of Bracken are often only twice pinnate, and in such cases the pinnules, instead of being divided into distinct and separate lobes, are merely what is called pinnatifid, or deeply cleft, the lobes being run together at their bases. Along on each side of the mid-veins of the lobes are alternate veinlets, which are sometimes once and sometimes twice forked as they run to the margins of the lobes. It is along these lobe margins that the fructification of the Bracken is produced in lines, the indusia or coverings of the spore cases being formed by a rolling back of the bleached edges of the lobes. When the spores are ripe the under side of the Bracken has a very beautiful appearance, the rust-coloured marginal lines of spore cases meeting at the lobe points in the form of angles, and finely contrasting with the dark-green colour of the rest of the frond. From the normal form, which has just been described, of the Bracken, there are in these Islands about eight or ten departures or varieties. But this is the only species which we possess of the genus *Pteris*, which consists of Ferns whose sporangia are arranged in continuous lines on the under edges of the lobes of the fronds, and covered by

indusia, formed of the reflexed or bent back margins of the lobes. Our native species occurs at all heights, from the sea level to two thousand feet above it.

DISTRIBUTION.—The Bracken is found throughout Europe, except towards the extreme north. In Asia it occurs, amongst other places, in Siberia, Kamtschatka, China, India, Ceylon, in the oriental Archipelago and in the Philippine Islands. In Africa, north, east, west, and south, as well as in a great number of the islands surrounding that vast continent. It occurs also in the United States of America, in Canada and California, in Mexico and Guatemala, and in various parts of South America. It is also found in the Islands of the seas in various parts of the world. In the British Islands it is to be found almost everywhere, in many places literally covering large tracts of ground. It will grow plentifully even on open downs exposed to the sun, and where the soil is hard and sandy. But in such places it becomes dwarfed and stunted. It is under the moist shelter of woods and on the high and damp embankments of shady lanes that it attains its greatest perfection, becoming in those positions an object of extreme grace and beauty.

CULTURE.—Amongst the hardiest of Ferns the Bracken will grow readily, even in ordinary garden soil. But the soil which will the best suit it is rich yellow loam with a covering of leaf-mould. The first possesses the especial advantage of keeping the rhizomas and rootlets continually damp, whilst the leaf-mould supplies the nutriment which the rain carries down to the loamy subsoil. The finest specimens of Bracken—quite a forest of them indeed—we remember to have found growing in a wood the subsoil of which was stiff yellow loam, and the surface soil spongy leaf-mould. In the garden the Bracken must have plenty of room for its travelling rhizomas, and the position should be moist and sheltered. Especial care, however, is needed in removing

it from its native wilds, so that the whole of it may be taken up uninjured. It is difficult to successfully remove very large plants, on account of the depths to which their rhizomas descend into the earth. Small plants are therefore the best for removal, and these should if possible be taken up with a sufficient amount of earth, kept in an unbroken mass, to prevent any disturbance of the rhizomas or rootlets. Such plants will soon spread and develop into fine specimens.

2.

THE HARTSTONGUE.

Scolopendrium vulgare.

PLATE 2, FIGS. 2 AND 3, PAGE 185.

NEXT to the Bracken the most familiar amongst ferny forms is the Hartstongue. In some places it is even better known than the Bracken, on account of the fact that, unlike the latter, it can withstand the frosts of winter and look fresh and green throughout the year. It grows on the sides and upon the tops of sheltered hedge-banks; in moist lanes; in the damper and darker recesses of woods, loving especially the shelter of underwood, and a position upon the side or at the top of little knolls or undulations of the ground. It grows also upon the sides of moist stony embankments; upon perpendicular stone walls, or upon the perpendicular sides of wells. To the walls of an old ruin the Hartstongue frequently adds a striking element of picturesqueness and beauty. It is always, however, much smaller in size when growing in open stony places than when it grows upon moist and sheltered earth-banks or in shady woods.

DESCRIPTION.—*Scolopendrium* is derived from *Scolopendra*, the name of the centiped, because of a fanciful resemblance between the singular-looking lines of spore cases at the backs of the fronds of the Hartstongue and the feet of the centiped. The specific name *vulgare* refers to the fact of the plant being so common and widely distributed. The fronds of the Hartstongue—which is an evergreen species—rise from a

tufted rootstock, the crown of which is slightly elevated above the surface of the soil. Large plants produce a great number of fronds. The maximum length of the latter, including stipes and leafy portion, is usually stated to be two feet. But we have ourselves seen fronds of this handsome Fern three feet long, and we believe it possible that this length may be exceeded even in these Islands when the Hartstongue is growing under conditions peculiarly adapted to its development. When growing on walls, the fronds are sometimes only an inch or two in length when fully developed; and they vary from this length to three feet, according to the situation of the plant. The stipes is generally about one-third the length of the entire frond. The leafy portion of the latter in its normal form is simple or undivided and tongue-shaped, tapering to a point at its apex, widest at the centre, narrowing towards its base, but again expanding into a kind of ear-shaped projection on each side of the rachis where the latter commences. The base of the leafy portion of the frond is thus hollowed upwards on each side of the rachis. The fronds are usually a rich shining green, smooth and leathery. A very distinct feature is the rachis or mid-rib, which is carried up in continuation of the stipes, from the base to the apex of the leafy portion of the frond. It is thick and elevated into a kind of ridge. From each side of it run towards the margin of the frond, a series of free veins once or twice forked. The term 'free' as applied to a vein, indicates that after it leaves the mid-rib—however much it may itself become forked—it does not run into any neighbouring veins, but proceeds 'free' to the margin of the frond. The veins run closely together, taking a somewhat oblique—upward—direction. Their arrangement—a very beautiful one—can be clearly seen by placing the frond against the light. Upon certain of them on each side of the rachis, at the back of the frond, and generally at intervals of about the

eighth of an inch from each other, are the lines of fructification. Each line—running in the direction of the veins and midway between the mid-rib and the edge of the frond—consists of twin sori, covered when young with a thin whitish cuticle which is the indusium. As the spore cases ripen, the indusium splits in the centre and is thrown back. The sori set face to face, then become confluent, and being brown in colour look at a distance like brown caterpillars. The fructification is usually confined to the upper two-thirds of the frond. The width of the latter varies from an inch, or even less, to two or three inches, according to the length and development of the plant. The stipes is sometimes of a dark purplish colour, and the same colour is frequently continued along the rachis. Both stipes and rachis are furnished—the former often abundantly—with rust-coloured scales. If these are examined with a powerful magnifying glass, it will be seen that their substance is beautifully reticulated. The rootlets of the Hartstongue are long, fibrous, and abundant. It is of course the normal form of the plant which has been described. This form, however, is subject to the most extraordinary variation. Nearly five hundred distinct varieties—which assume almost every conceivable shape—have actually been named and described in the British Islands alone; and no doubt there are many undiscovered variations which would still further swell the number. When once the eye is familiarized with the form and habit of the Hartstongue, however, there will be no difficulty in recognizing the varieties. Merely to enumerate and describe them would fill a small volume. The species *vulgare* is the only one which we possess of the genus *Scolopendrium*, which includes Ferns having on the backs of their fronds elongated clusters of sporangia, running parallel with and close to each other, and covered by indusia, which when the spores are ripened split down the centre longitudinally and between the twin sori.

DISTRIBUTION.—The Hartstongue is to be found—from the sea level up to six hundred feet above it—in almost every country throughout Europe. In Africa it occurs in Algeria; also in the Azores, and in the island of Madeira. In Asia, it is found in Erzeroum, in Persia, in the Ural Mountains, and in the Caucasian Mountains. It inhabits, though somewhat sparingly, the United States of America. It occurs in every county of England, in some localities being extremely abundant. In Wales it is found in Anglesea, and in the counties of Brecknock, Carmarthen, Carnarvon, Denbigh, Glamorgan, and Pembroke. It is not so abundant in Scotland, but nevertheless occurs in Aberdeenshire, Ayrshire, Berwickshire, Dumfriesshire, Edinburghshire, Fifeshire, Forfarshire, Kincardineshire, Kirkeudbrightshire, Lanarkshire, Morayshire, Nairnshire, Renfrewshire, Sutherlandshire, and Wigtonshire; also in the Isles of Islay, Orkney, Shetland, and Skye. In Ireland it is found—often most abundant and beautifully developed—in the counties of Antrim, Clare, Cork, Dublin, Galway, Kerry, Kilkenny; in King's County, Limerick, Sligo, Tipperary, Waterford, and Wicklow. It abounds in the Channel Islands, and is also found in the Isle of Wight and in the Isle of Man.

CULTURE.—Shade, moisture at the roots, and a moist atmosphere are essential for promoting the finest development of the Hartstongue. It can be grown on rockwork in the open air, on a shady bank in the open garden, in the green-house, or in pots in the house. Small plants can be grown in a closed Fern case. The simple form of its rich-looking fronds makes it indispensable for providing a contrast to the more feathery fronds of other species of Ferns. The best soil for it is a compost, consisting half of yellow sandy loam, and half of rich peat and leaf-mould, mixed in equal quantities. It must be well drained at its roots. In planting, care should be taken to fix it firmly in the soil,

with the upper part of the crown well elevated. Within reach of the spray of a fountain, or shadily placed amidst stones on a bank overhanging water, it becomes a singularly beautiful object, its fronds seeming to revel in the moist atmosphere which surrounds them under such circumstances. The rootstock of the Hartstongue can be divided with a sharp knife into three or four pieces, so cut, that each portion retains an equal share of the caudex and two or three fronds. Each portion thus detached will grow if separately planted.

INDEX TO PLATE 3.

/ FIG. 1. LADY FERN

[*Athyrium filix-femina*]

2. MALE FERN

[*Lastrea filix-mas*]



2

1

3.

THE LADY FERN.

Athyrium filix-fœmina.

PLATE 3, FIG. 1, PAGE 199.

‘ Not by burn, in wood, or dale,
Grows anything so fair
As the plummy crests of emerald pale
That wave in the wind, or sough in the gale,
Of the Lady Fern, when the sunbeams turn
To gold her delicate hair.’

POETS may fairly claim the right to describe the Lady Fern ; for this beautiful plant is unquestionably the fairest and most delicately graceful of ferny forms, whether large or small. Those who would see this charming member of the Fern family must—

‘ Hie to haunts right seldom seen,
Lovely, lonesome, cool, and green,
Over bank and over brae
Hie away, hie away.’

They must go—

‘ Where the copsewood is the greenest,
Where the fountains glisten sheenest,
Where the morning dew lies longest,’

for—

‘ There the Lady Fern grows strongest,’

arching outwards its delicate fronds, whose feathery tips bend gracefully downwards, as if to return to the earth or stream below, with grateful acknowledgments, the silvery dew-drops

which have distilled upon them. It will be supposed from what has been said, that it is in the most moist and cool of moist and cool situations that the Lady Fern is to be found—on the shadowed banks of running streams, where the passing water dashes amongst stones and fills the air with spray; between the projecting stones at the sides and at the feet of waterfalls; in the dampest hollows of woods and coppices where the ground is saturated by oozing water; or upon the damp sides of shady hedge-banks; but, wherever growing, always adding a singular charm to its surroundings.

DESCRIPTION.—The delicately beautiful aspect of this plant has suggested its common name of ‘Lady Fern,’ and its specific name of *filiæ-femina*. Its generic name, *Athyrium*, is derived from a Greek word, *athyros*, ‘opened,’ and refers to the opening out of the indusium when it has been burst by the growth of the spore cases. The rootstock of the Lady Fern is thick and tufted, generally raised somewhat above the soil, and it has an abundance of fibrous rootlets. From the crown of the rootstock grow up a mass of light-green herbaceous fronds, which vary in length according to the position of the plant, from a foot to as many as five feet. The stipules are usually about one-third the entire length of the fronds, light green or yellowish in colour, but sometimes purple, and furnished with a few scales at their bases. They are very brittle and herbaceous. The fronds are lance-shaped, tapering towards the base and towards the apex, and widest about the centre. They are bi-pinnate, the pinnæ—lance-shaped and tapering—placed in pairs on opposite sides of the rachis—which is channelled throughout on its upper side—or alternately along it on each side towards the apex. The pinnæ are divided into serrated pinnules, somewhat oblong and blunt pointed, and usually placed in pairs along on opposite sides of the mid-stems, each pair becoming smaller towards the apices of the pinnæ, until their distinc-

tiveness is lost. In the same way the distinctiveness of the pairs of pinnæ becomes lost at the apex of the frond. The veining of the pinnules can be very clearly seen if the frond be examined against the light. The mid-vein of each pinnule takes a wavy course from base to apex. From it proceed alternate venules, sometimes single and sometimes forked—terminating in the segments of the pinnule. Upon these venules the spore cases are clustered in roundish or kidney-shaped heaps, generally midway between the edges of the pinnules and the mid-veins, and on each side of the latter. The clusters, or sori, are so arranged that they look to the naked eye like lines of little brownish spots—five or six in each line—running parallel with and on each side of the mid-veins. They are covered at first by kidney-shaped indusia, which are fringed on the side towards the mid-veins of the pinnules, and which as the spore cases grow and become ripe burst and liberate them, and are then thrown back and disappear. If the sori be then examined with a powerful glass it will be seen that they are little heaps of shining, roundish, or pear-shaped cases of a light-reddish, chaffy colour, in which are contained the minute dust-like spores.

In the British Islands alone there are no less than three hundred variations from the normal form of the Lady Fern which has been described, each of which bears a separate Latin name, and many of which—the Ferns, not the Latin names—are extremely beautiful. It will be a delightful occupation for the Fern lover to hunt for all the varieties of normal species of these beautiful plants. But it is not necessary to burden the memory with a Latin name for each variety, especially if it be remembered that varieties are to a large extent merely accidental departures from the normal forms, and frequently do not preserve their peculiarities under cultivation. All the varieties of the Lady Fern are deciduous, their fronds disappearing on the icy approach of

winter. *Filio-femina* is, however, our only native species of the genus *Athyrium*, which consists of Ferns distinguished by having kidney-shaped indusia attached by one side to the frond, whilst the other side is free and fringed with little hairy segments.

DISTRIBUTION.—The Lady Fern is found at various elevations reaching to three thousand feet above the sea in each of the four quarters of the world. In Europe it inhabits, besides the British Islands, Belgium, Crete, Croatia, France, Germany, Greece, Holland, Hungary, Italy, Lapland, Portugal, Russia, Scandinavia, Spain, Switzerland, and Transylvania. It occurs in the islands of the Mediterranean ; in the Caucasus and in the Ural Mountains ; in India and Russian Asia ; in Algiers ; in the Canary group of islands, and in Madeira. It is found throughout North America, including British Columbia, Canada, and the United States. It occurs in Vera Cruz and in Cuba, as well as in the northern part of South America, including Venezuela ; also in Bolivia. It is also found in Australia. In England it occurs in the counties of Bedford, Berks, Buckingham, Cambridge, Cornwall, Cumberland, Derby, Dorset, Devon, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Monmouth, Norfolk, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Sussex, Warwick, Westmoreland, Worcester, Wilts, and York. In Wales it occurs in Anglesea, Brecknockshire, Carmarthenshire, Carnarvonshire, Denbighshire, Flintshire, Glamorganshire, Montgomeryshire, and Pembrokeshire. In Scotland it is found in Aberdeenshire, Argyleshire, Banffshire, Caithness, Cromarty, Clackmannanshire, Dumbartonshire, Dumfriesshire, Edinburghshire, Fifeshire, Forfarshire, Invernessshire, Kirkcubrightshire, Lanarkshire, Morayshire, Perthshire, Renfrewshire, Roxburghshire, Stirlingshire, Sutherlandshire ; in the

Isles of Arran, Cantire, Harris, Islay, Lewis, Orkney, and North Uist. In Ireland it inhabits—being often very plentiful where it occurs—the counties of Antrim, Clare, Cork, Dublin, Galway, and Kerry; King's County, Kilkenny, Killarney, Louth, Limerick, and Waterford. It also inhabits the Channel Islands.

CULTURE.—Though one of the most delicately-beautiful of our native Ferns, *Athyrium filix-fœmina* is one of the most vigorous growers, and in a certain sense one of the most hardy. It will grow anywhere provided it can secure perfect shade and abundant moisture—on the open rockery, in pots, or under glass. A soil of peat and light sandy loam in equal proportions, with a further admixture of leaf-mould equal to one-fourth of the whole will admirably answer its requirements. It loves best the foot of a rockery, and it must have plenty of room to display its exquisite fronds. Amongst stones at the base of a fountain, within reach of the spray, or at the shadowy mouth of a grotto or cavern where moisture drops upon it, it will find an especially congenial place. If kept in a pot the latter should stand in a saucer of water. The moist atmosphere of the Fern house, subterranean garden, or case, will also promote its vigorous growth, and aid its most perfect development.

INDEX TO PLATE 4.

FIG 1. ROYAL FERN

[*Osmunda regalis*]

2. HAY-SCENTED BUCKLER FERN

[*Lastrea recurva*]



4.

THE HARD FERN.

Blechnum Spicant.

PLATE 2, FIGS. 4 AND 5, PAGE 185.

LOVING to grow in just such situations as those in which *Athyrium filix-femina* delights, the Hard Fern will often be found in company with the latter, affording with it, however, a contrast so marked as to be striking. Upon embankments soddened by trickling water from some higher ground above; on the water-soaked bed of a wood; upon a wet and sheltered stream bank; among stones at the foot of a fountain, this Fern is mostly found, sometimes however occupying a drier situation. We have seen it for miles, for instance, crowding the lower sides of hedge-banks skirting the high roads. But it is always grandest in form and development when its roots are soaked in moisture, and its glossy fronds are made yet more glossy by being bathed in an atmosphere of moisture.

DESCRIPTION.—From the generic name of this handsome Fern we derive little which is descriptive. *Blechnum* is from the Greek *Blechnon*, which only means ‘a Fern.’ The word *spicant*, ‘spiked,’ however, at once gives us the idea of the true character of the Hard Fern. ‘The hard, spiked Fern’ it might appropriately be called. It has in general a somewhat thin though tough rootstock, with an abundance of wiry rootlets. From its crown grow two kinds of fronds—barren and fruitful, the latter being always longer and sometimes double as long as the former. The sterile fronds according

to the situation of the plant grow from six inches to two feet, and the fertile fronds from twelve inches to three feet in length. The stipes of the barren frond is seldom more than one-fourth the length of the entire frond, and sometimes not more than one-sixth or one-seventh its length. It is of a reddish-brown or purplish colour, having a few chaffy scales of the same colour, though sometimes darker, at its base. The leafy portion is narrow and lance-shaped, varying from about half an inch to two inches broad—according to the length of the frond—where it is widest at its centre, tapering to a point at its apex, and tapering even more rapidly downwards. The rachis is mostly green, channelled throughout its upper side, rounded underneath. On each side of it, almost—at first appearance—in opposite pairs, but really in alternation, is a row of pinnules, narrow, oblong, and almost straight-edged, with blunt ends distinctly widened at their bases, and attached by the whole width of the latter, and not by stems, and sometimes run together at their bases. The frond in fact has very much the appearance of a double comb. As we have seen, the pinnules decrease in length towards the apex of the frond, retaining, however, until they are merged into a sort of leafy point, their oblong form. But towards the base the pinnules dwindle to little roundish lobes often no bigger than a pin's head. The venation consists of a principal vein running down the lobes from their bases to their apices, and of forked venules branching out on each side from the mid-veins to the margins of the lobes, where they terminate in a kind of club-shaped head. The fertile fronds have very much the same general outline shape as the barren ones. The distinction between the two consists in the greater length of the former, and the narrowness or contraction of the pinnules, which are not more than the twelfth of an inch wide. The venation of the pinnules is the same as in the barren fronds. The spore cases are borne in lines along on each side of the

mid-veins of the pinnules, and at their earliest stage of growth are distinct; but as they develop they become confluent and cover the entire under-surface of the pinnules. They are covered by indusia which, as the spore cases become ripe, burst on the side nearest the mid-rib of the pinnule, and are thrown back, adhering however to the edge of the latter. At this stage the whole under side of the fertile frond is covered by rich brown masses of seed, giving to it a velvety appearance. The stipes of the fertile frond is about half the length of the leafy portion, and it, as well as the rachis, is of a purplish colour. In the barren fronds the pinnules are frequently pinnatifid, but in the fertile ones they are never so, being what is called simply pinnate. The texture of both fronds is thick and leathery; the barren ones being mostly of a glossy green, and drooping around the taller and more erect fruitful spikes which rise up in the centre of the barren clusters. The latter are evergreen, but the fruitful spikes disappear, as soon as they have shed their ripened spores, on the approach of winter. There have been discovered no less than seventy departures from the normal form of this Fern; but this species is the only one in Britain of the genus *Blechnum*, which consists of Ferns having their spore cases borne at the backs of the pinnules in straight lines midway between the mid-veins of the pinnules and the edges of the latter, and protected by linear indusia.

DISTRIBUTION.—From the sea level to a height of four thousand feet above it, this Fern is found to grow. It occurs very generally throughout the countries of Europe; in Japan; in the north of Africa as well as in the south at the Cape of Good Hope; also in the Azores, in the Canary group, and in the island of Madeira; in the north-west of America, in the Chilian province of South America, and in Australia. In England it is widely distributed, occurring in the following counties: Bedford, Berks, Cambridge, Chester, Cornwall,

Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Lincoln, Leicester, Middlesex, Monmouth, Northampton, Norfolk, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it is found in the counties of Anglesea, Brecknock, Carmarthen, Carnarvon, Denbigh, Flint, Glamorgan, Merioneth, and Pembroke. In Scotland it is an inhabitant of Aberdeenshire, Argyleshire, Banffshire, Berwickshire, Caithness, Clackmannanshire, Cromarty, Dumfriesshire, Dumbartonshire, Edinburghshire, Fifeshire, Forfarshire, Inverness-shire, Kirkcudbrightshire, Kincardineshire, Kinross-shire, Lanarkshire, Morayshire, Perthshire, Renfrewshire, Roxburghshire, and Sutherlandshire, of the Orkney and Shetland Isles, and of the Isles of Arran, Cantire, Harris, Islay, Lewis, and North Uist. In Ireland it occurs in the counties of Antrim, Clare, Cork, Down, Dublin, and Galway (including the Arran Isles); in King's County, Limerick, Mayo, Tipperary, Waterford, and Wicklow. It is also found in Jersey and Guernsey.

CULTURE.—The handsome evergreen fronds of this Fern and its hardy nature render it a most desirable acquisition to the open rockery. It may also be grown in pots or under glass. But in the latter case it is suitable rather for the more roomy Fern house, than for the small Fern case, although small specimens, and the smaller varieties of the normal form of *Blechnum spicant*, make pretty ornaments for rockery in small cases. But absolute shade and abundant moisture both for roots and fronds are essential for this Fern. The lower tiers of an out-door rockery are the most suitable, and the aspect in which it is placed should be northern. We have found some of the finest specimens of *Blechnum* growing in stiff reddish or yellowish loam, and sometimes in

woods, in a shallow bed of leaf-mould, upon a sub soil of clay. Hence in cultivation half the compost may with advantage consist of stiff yellow loam, whilst the other half may be made up, in equal proportions of peat, leaf-mould and sand; or the Fern may be planted with its ultimate rootlets touching a stratum of stiff loam or light clay, whilst the surface soil may consist of pure leaf-mould. The position which, as to shade and dripping moisture, will best suit the Lady Fern will be found admirably to accommodate *Blechnum spicant*.

5.

THE ROYAL FERN.

Osmunda regalis.

PLATE 4, FIG. 1, PAGE 207.

AMONGST the most moisture-loving of our native species is this noble Fern. It loves excessive moisture for its roots, growing indeed in greatest perfection in bog soil. It is especially fond of inhabiting the sheltered banks of streams; and at the lakes of Killarney it attains the grandest form which it has ever been known to assume in these Islands. In small lake islands it sometimes takes entire possession of the ground; and a legend has been handed down from the time of the Danish invasions of Britain, explanatory of the generic name of *Osmunda*—an island, covered with large specimens of this Fern, figuring prominently in the story.

Osmund, the ferryman of Loch Tyne, had a beautiful child, who was the pride of his life and the joy of his heart. In those days, when the merciless Danes were making their terrible descents upon our coasts, slaughtering the peaceful inhabitants and pillaging wherever they went, no man could say how long he would be free from molestation and outrage. But Osmund, throughout the troublous times, had lived peacefully with his wife and beautiful daughter. The peaceful calm of his life was, however, destined to be broken. One evening the ferryman was sitting, with his wife and child, on the margin of the lake, after his day's work. The setting sun was tinging with roseate glory the fleecy banks

of cloud, piled up against the horizon, silvering the surface of the rippling lake and adding a richer hue to the golden locks of Osmund's darling child. Suddenly the sound of hurrying footsteps startled the quiet group. Men, women, and children came running from the neighbouring village, and, breathlessly, as they passed, they told the ferryman that the terrible Danes were coming. Quick as thought Osmund sprang to his feet, seized his wife and child, and hurried them into his ferry boat. Away he rowed with them—pulling for very life—in the direction of a small island in the loch, densely covered with the tall and stately fronds of the Royal Fern. He quickly hid his precious charges amongst the clustering fronds, and then rowed rapidly back to his ferry place. He had rightly divined that the Danes needed his assistance, and would not hurt him. For many hours of the ensuing night he worked with might and main to carry the fierce invaders across the ferry. When they had all disappeared on the opposite bank, Osmund returned to his trembling wife and child, and brought them safely back to his cottage. In commemoration, it is said, of this event the fair daughter of Osmund gave the great island Fern her father's name. Those who care not to accept this fanciful origin of the name *Osmunda*, will perhaps incline to the suggestion which has been made, that the generic name had been derived from an old Saxon word signifying strength, the specific name indicating its royal or stately habit of growth.

DESCRIPTION.—The largest of our native species, *Osmunda regalis*, more nearly than any other amongst them, approaches the form of a tree Fern. It grows from a height of two or three feet to twelve. The caudex or rootstock is stout and tufted, and in old and finely-developed plants it is raised to a height of two feet or more from the ground, in this particular more especially resembling the habit of a tree

Fern. From the crown of the rootstock is thrown up a cluster of fronds of a dull yellowish green, with a stipes—about the same length as the leafy portion—of a sort of hay colour. The form of the fronds is broadly lance-shaped, and they are of two kinds, barren and fertile, twice pinnate, having rachides the same colour as the stipes, and channelled along their upper sides. The pinnae in the barren fronds are arranged in pairs along the rachis, almost opposite each other. They are longest at the base, decreasing in length as they approach the apex of the frond, where they become merged into simple pinnules. Along on each side of the pinnae are rows of pinnules attached to the mid-stems of the pinnae—the secondary rachides—by very short stalks, which are in reality a continuation of the mid-stems, and placed each somewhat distant from the other. Sometimes the pinnules are placed along the pinnae in opposite pairs, and sometimes in alternation on the opposite sides, largest and longest near the main rachis of the frond, and getting gradually smaller towards the points of the pinnae, where the pinnules merge into a single, pointed lobe. The pinnules are oblong, blunt-pointed, from about an inch to three inches long, according to the size of the plant, and from about a third of an inch to half an inch or more broad. The venation consists of a mid-vein, from which—on each side—branch to the margin of the pinnule a series of venules once or twice forked, and running nearly parallel with each other. The fertile frond differs from the barren one in having the pinnules of the highest of its upper pairs of pinnae contracted, and bearing upon their margins, attached to the system of veins, spore cases which are somewhat globular in form, stalked, and two-valved. These spore cases cluster so thickly on the contracted leaflets or pinnules as to give to them, when brown and ripe, somewhat the appearance of a flower spike. Hence the name of ‘Flowering Fern,’ which

is often, though of course erroneously, given to this species. Sometimes in the fruitful fronds the fertile pinnules are not confined to their upper portions, or even to the upper portion of any of the pinnules, for the bases or the middle parts of pinnules which are in other respects barren, are sometimes contracted, and what is called sporiferous or spore-bearing. The venation in the fruitful fronds is the same, as in the pinnules of the barren fronds, the only difference being that in the former the mid-veins are the only veins which are fully developed. *Osmunda regalis* is a deciduous species, its fronds not being able to withstand the frosts of winter. Three or four varieties from the normal form of this Fern have been discovered in the British Islands; but the species itself is the only one we possess of the genus *Osmunda*. This genus belongs to a group of Ferns called *Osmundaceæ*, which includes Ferns which when still unfolded have their fronds rolled in spirally downwards, the apices occupying the centre,—their globular or oblong spore cases being without the elastic rings,—which in most of the genera of Ferns gird the sporangia,—and bursting, when fully developed, by a vertical split. The genus *Osmunda* of this group consists of Ferns with marginal-borne globular spore cases, arranged in dense and branching though irregular clusters, on the pinnae at the apices of certain of the fronds.

DISTRIBUTION.—From the fact that the Royal Fern loves to grow in marshy or boggy situations, it will be inferred that it is not found at great altitudes; and consequently it is very seldom that it occurs in any place which is more than three hundred feet or so above the sea level. Under that elevation, however, it is very widely and plentifully distributed, sometimes almost monopolizing considerable areas. It is found in the following countries of Europe, namely, Belgium, Croatia, Denmark, France, Germany, Holland, Hungary, Italy, Portugal, Russia, Spain, Sweden, Switzer-

land, Turkey, and Transylvania. It occurs in Algeria, in the Azores, in the island of Madagascar, in India, in the United States and Canada, in Mexico, in Newfoundland, and in Brazil.

In England it is found in the counties of Bedford, Berks, Bucks, Cambridge, Chester, Cornwall, Cumberland, Devon, Dorset, Durham, Essex, Hants, Hereford, Lancaster, Leicester, Middlesex, Monmouth, Norfolk, Northumberland, Nottingham, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. It is found also in the Isle of Wight, in the Isle of Man, in Jersey, and in the Isle of Purbeck. In Wales it occurs in the counties of Anglesea, Carnarvon, Carmarthen, Denbigh, Flint, Glamorgan, Merioneth, and Pembroke. In Scotland it is found in the counties of Aberdeen, Argyle, Dumbarton, Dumfries, Fife, Forfar, Kincardine, Kirkcudbright, Lanark, Perth, Renfrew, Ross, Stirling, and Sutherland, as well as in the islands of Arran, Bute, Harris, Islay, Lewis, Mull, Orkney, Shetland, and North Uist. It grows in the 'Green Isle,' in the counties of Clare, Cork, Donegal, Dublin, Galway, and Kerry; in King's County, Mayo, Tipperary, Waterford, and Wicklow.

CULTURE.—Within reach of the spray of a fountain, or on the banks of a running stream, where its roots can reach and touch water, this handsome species will thrive best. If planted in ordinary rockwork it should be in the lowest, most moist, and most shady tier. The soil should chiefly consist of good peat, which from its spongy nature, keeps around the roots of *Osmunda* constant and abundant moisture. But if to the peat be added a mixture, in equal proportions, of rough sand and leaf-mould, the compost will be improved. Peat, however, should form at least three-fourths of the compost, one-fourth only being leaf-mould and sand. A small case is unsuited for the Royal Fern, on account of the large

size to which it grows ; but in a Fern house it may be very successfully grown. It grows very well also in pots ; but in all cases the soil for it must be the same. In removing it from its native home care must be taken to secure the whole of its large caudex, as well as the mass of its rootlets ; for success in its culture will largely depend upon the care which is taken in removing it to its artificial home.

6.

THE TRUE MAIDENHAIR.

Adiantum capillus-Veneris.

PLATE 5, FIG. 1, PAGE 225.

ONE of the most delicately-beautiful, as also one of the rarest of our native Ferns is the True Maidenhair. It inhabits chiefly the moist, rocky nooks of our sea cliffs and their dripping caverns. It but seldom grows inland, for the sea air, in its wild state, appears to be essential to it. Its favourite habitats are on limestone coasts, and it loves—on the open seaward side of a cliff, and not within its cavernous recesses—a situation where a trickling stream of water from the cliff-top flows over or near its delicate rhizomas. But it mostly is found in the highest and least accessible parts of a cliff, nestling, perhaps, under the dark shelter of a jutting fragment of rock, or growing in the dark, moist depth of little hollows in the cliff side. The Fern hunter, who has boldly scaled a precipitous rock in search of the Maidenhair, may look into such a hollow, and for a moment, perhaps, can see nothing but darkness, and hear only the soft trickling sound of water. But after he has been looking for a moment he will, perhaps, begin to recognize some delicate forms of the Maidenhair Fern, revelling in the coolness and moisture. Often the Maidenhair will grow on the perpendicular side of the cliff, if the position be sheltered by some shrub or plant.

DESCRIPTION.—The botanic name of the True Maiden-

hair is descriptive of two prominent peculiarities of this beautiful Fern. *Adiantum* is derived from the Greek word *adiantos*, which means dry or unmoistened, and refers to the singular power which the pinnules of the fronds have of resisting the contact of water. If water be poured on to these pinnules it never succeeds in wetting them, but rolls off in silvery drops. The specific name—*capillus-Veneris*—‘hair of Venus,’ refers to the beautiful hair-like stipes and rachides of this Fern. It is an evergreen species, growing from a creeping stem or rhizoma, which is thin and delicate, covered with black scales, and furnished with black fibrous rootlets. From various parts of the rhizoma grow the fronds—varying from six inches to two feet, and supported on fine, hair-like black and shining stems, which are usually of the same length as the triangular-shaped leafy portion of the frond, but sometimes double and sometimes treble that length. Small specimens are often only bi-pinnate; but good specimens are tri-pinnate. Taking the latter form for description we find that branching out alternately from the principal rachis on each side are pinnae, the mid-stems of which are more finely hair-like than the main rachis. Placed alternately along these mid-stems or secondary rachides, are yet finer black hair-like stems, upon which are borne somewhat bluish green fan-shaped lobes, attached by means of the finest of hair-like stalks. The lobes also are mostly placed alternately along the branches which support them. They have pointed bases, and their upper margins are notched or lobed. The venation of the lobes consists of two principal veins starting from the pointed base in continuation of the connecting lobe stem, each principal vein being forked two or three times. The ultimate venules proceed to the notched margins of the lobes, where they terminate—in the barren fronds. In the fertile fronds the outer edges of the lobes are turned back or bent under, to form the indusia or

covering of the sori. The part thus turned back is bleached, and bears on its under surface the spore cases, which are connected with the venation of the lobes. When the spores are ripe, the bleached turned-back cuticle of the lobes turns to a dark brown colour. Like the Ferns already enumerated the True Maidenhair is the only British species of the genus *Adiantum*, which includes Ferns whose sporangia are distributed in patches on and under the bent-back margins of the lobes of the frond pinnules, which margins constitute the indusia.

DISTRIBUTION.—In Europe the True Maidenhair is found in Belgium, Dalmatia, France, Greece, Italy, Portugal, Spain, Switzerland, and Turkey. It is especially abundant, on account of the warmth of the climate, on the shores of the Mediterranean. It is found in China, India, Java, Persia, and Syria. In Africa, it inhabits Algiers and Abyssinia, and is found in Madeira, the Canary and Cape de Verd Islands, the Azores, and Madagascar; also on the south and south-east coasts of Africa, at Natal and Algoa Bay. It is also found in California, Texas, Mexico, and Guatemala; in South America, Dominica, Jamaica, St. Vincent, and Trinidad, as well as in the Sandwich Islands. In no part of the world, however, is it more abundant than in the islands of the Atlantic. In England it is very sparingly distributed. In Cornwall it has been found at Carelew; in a sea cave, called Carrick Gladden, between Hayle and St. Ives, and at Penzance. In Devon we have ourselves taken specimens from the cliffs at Ilfracombe and at Mewstone Bay, near Brixham. In Somersetshire it has been found on the Cheddar cliffs, and at Combe Down; and in Shropshire at Titherstone Clee Hill. In Wales it has been discovered on rocks at Dunraven, at Port Kirig, and at Barry Island, Glamorganshire. In Scotland it has been found on the banks of the river Carron in Kincairdineshire.

In Ireland its habitats have been discovered on the Cahir Conree mountain, near Tralee ; near Roundstone, Connemara, in the county of Galway ; at Lough Bulard, near Urrisbeg ; on the coast of the county of Clare, between Kremlin Point and Ballyvaughan, and in the Isles of Arran. In the Isle of Man it has been taken between Douglas and Peel, and also in Glen Meay. In Jersey and Guernsey also it has been found. There are, probably, many other habitats than those which have been given. But they have not been discovered because of the inaccessible places in which this beautiful Fern frequently grows. Even on accessible but little-known cliffs it may be discovered ; and the Fern hunter will always find the search for it a delightful and healthful occupation.

CULTURE.—It is only in very moist, warm, and sheltered situations that the True Maidenhair can be induced to grow on open rock-work. But under glass, whether in the Fern house or case, it will grow luxuriantly. Even in an open pot indoors if the atmosphere be cool and equable it will grow successfully. The soil should consist of one half light peat and sand, and light loam also one half. But intermixed with the soil there should be some small pieces of limestone ; and it will be advantageous to plant the rhizomas between blocks of limestone in the pot or case. Under glass, in a warm sitting-room the Maidenhair becomes thoroughly at home, and will throw up an abundance of its beautifully delicate and delightfully green fronds. As it has a creeping rootstock it is desirable not to give it too great a depth of soil in the pot or case where it is grown. Hence the compost should be laid upon a deep substratum of drainage consisting of broken pieces of soft brick or stone, broken crocks, and one or two little pieces of charcoal to keep the whole sweet. In this way good drainage will be secured, a special necessity of this charming Fern.

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- FIG. 1. TRUE MAIDENHAIR
[*Adiantum capillus-Veneris*]
2. ALPINE BLADDER FERN
[*Cystopteris regia*]
3. MOUNTAIN BLADDER FERN
[*Cystopteris montana*]
- X 4. BRITTLE BLADDER FERN
[*Cystopteris fragilis*]
5. ADDERS-TONGUE
[*Ophioglossum vulgatum*]
6. LITTLE ADDERS-TONGUE
[*Ophioglossum lusitanicum*]
7. MOONWORT
[*Botrychium lunaria*]
8. ANNUAL MAIDENHAIR
[*Gymnogramma leptophylla*]
9. MOUNTAIN PARSLEY FERN (FERTILE FROND)
[*Allosorus crispus*]
10. MOUNTAIN PARSLEY FERN (BARREN FROND)



7.

THE ANNUAL MAIDENHAIR.

Gymnogramma leptophylla.

PLATE 5, FIG. 8, PAGE 225.

THIS pretty little Fern, to which botanists have given a formidable name of no less than twenty-two letters, is the only representative amongst us of the charming group of gold-and-silver-fronded Ferns comprehended within the genus *Gymnogramma*. It has a peculiarity shared by no other British species; for it is an annual plant, dying each year soon after it has shed its spores. It inhabits the moist, shady sides of hedge-banks. From its love of warmth, as well as moisture, it prefers to grow in a position facing either the south or the south-west. But curiously enough; whilst it likes the shade of the dwarf vegetation on the hedge-sides, it avoids the deeper shade caused by the overhanging of trees. The moist oozing of water over the bank on which it grows is congenial to its luxuriant growth. It is a sociable little Fern, growing in the company either of moss or of other vegetation which loves a continually moistened soil. The growth of the spores of *Gymnogramma leptophylla* is unusually rapid. The process of germination is commenced in the early autumn. In the January following fronds have appeared an inch or a little more in length. These are succeeded by other and taller fronds; and the latter by still taller ones, which attain a height of eight or nine inches. By the end of April the full growth has

been accomplished, whilst by about the end of July the plant is dead.

DESCRIPTION.—The likeness of the delicate pinnules of this Fern to those of the True Maidenhair has no doubt suggested its English name. It has a small tufted rootstock, which throws up a few fronds, varying from three or four to eight or nine inches long. The stipes is dark brown, nearly black at the base, but bright green above—the rachis being also bright green. The first fronds thrown up—an inch or so in length—are, mostly, simply pinnate with alternately placed fan-shaped pinnules notched or cleft into lobes. The larger and later fronds are twice pinnate, the rachis bearing, alternately on each side of it, a series of pinnæ somewhat narrowly egg-shaped in outline, divided into alternate, fan-shaped, indented pinnules. The apex of the frond is blunt pointed, its general outline being, like its pinnæ, egg-shaped. The veining of the lobes in the pinnules is somewhat similar in general appearance to that in the True Maidenhair. It consists of a principal vein entering at the base of the pinnule and then becoming three or four times forked, the branches proceeding to the edges of the lobes of the pinnule. Along these branch veins the spore cases are placed in lines. They are uncovered, having no indusia, and hence the origin of the word *Gymnogramma*, which is compounded of two Greek words, *gymnos*, ‘naked,’ and *gramme*, ‘a line:’ the spore cases being arranged along the veins in naked lines. *Leptophylla*, as applied to the British species just described comes from *leptos* ‘slender,’ and *phyllon*, ‘a leaf;’ and very accurately describes this delicate little Fern, which is sometimes and appropriately called ‘The Slender Gymnogram.’

DISTRIBUTION.—The little plant has a wide geographical range, inhabiting warm countries in all the quarters of the globe. In Europe it inhabits France, Germany, Greece,

Italy, Portugal, Sicily, Spain, and Switzerland. It is distributed also over the Canary Islands, and is found in the Azores, and in Madeira ; also in Abyssinia, Algiers, Morocco, and at the Cape of Good Hope. It is an inhabitant of India, and the Islands of the Persian Gulf ; also of Mexico, Vera Cruz, and Victoria ; of New Zealand and Tasmania. Like its namesake, the True Maidenhair, it is particularly abundant on the shores of the Mediterranean, and in the islands of the Atlantic Ocean.

In the British Islands, however, its only known habitat is Jersey. It is therefore politically and not geographically a British Fern ; as it would be a natural and obvious arrangement to include the flora of the Channel Islands in the flora of France and not in that of the British Isles. In Jersey, where it was first discovered in the year 1852, it is tolerably abundant in one or two localities. It is often found growing on moist sheltered hedge-banks facing southwards, in company with *Marchantia*. The localities named as its Jersey habitats are St. Aubin, La Haule, and St. Lawrence. No varieties from the normal form of this Fern have been discovered in Jersey.

CULTURE.—The best method of growing *Gymnogramma leptophylla* is under glass. Its culture is interesting on account of its rapid development from the spores. The soil must be light sandy loam, with leaf-mould for one-fourth of the compost. If the plant be kept in the Fern house, the spores will freely drop from the ripe frond, and germinate on almost any damp porous substance they may chance to fall upon. If it be desired specially to raise the spores, a shallow seed-pan wide enough to admit within it a small bell glass, should be filled to three-fourths of its depth with drainage consisting of soft broken brick. Upon this should be placed a thin layer of sphagnum moss, and upon this again, a compost an inch or two deep consisting of light

sandy loam three parts and leaf-mould one part. When the compost has been thoroughly moistened, the spores should be shaken on to it from a ripe frond, and a bell glass put over it, and pressed down a little into the earth, so as to well keep in the moisture. Watering should be accomplished not by wetting the surface with a watering-pot, but by standing the pan for a few minutes in water until by capillary attraction the moisture has thoroughly soaked the soil through. Air for a few minutes must be given occasionally : and with care, and the kind of attention which all Ferns more or less require, the rapid growth of this pretty and delicate little plant will be assured.

8.

THE MOUNTAIN PARSLEY FERN.

Allosorus crispus.

PLATE 5, FIGS. 9 AND 10, PAGE 225.

WE have here another Fern which is the only one of its genus inhabiting the British Islands—a genus which includes Ferns whose spore cases, massed in little round heaps at the backs of their fronds, become confluent when fully developed, and have no special indusium, but are covered by the frond margins, which are turned back over them. The Mountain Parsley Fern, as its name indicates, loves rocky habitats in mountainous districts, growing, indeed, in such localities from the level of the sea to an altitude of three thousand five hundred feet above it. It sometimes densely covers a considerable space on the mountain sides, its roots penetrating the earthy seams in its rocky home, and its fronds, adding freshness and beauty by their bright green verdure to their surroundings.

DESCRIPTION.—The generic name, *Allosorus*, comes from two Greek words *allos*, ‘various,’ and *sorus*, ‘a heap,’ and indicates, it is probable, the variation in the clusters of spore cases which, at first massed in separate heaps, become, by accretion, confluent. *Crispus* refers to the erisped or somewhat curled appearance of the barren fronds, which also bear a very marked resemblance, at first sight, to a tuft of parsley. Hence the common name of this pretty Fern. It grows from a thick tufted rootstock, which possesses a great

abundance of fibrous rootlets. The fronds grow up in a mass of tufts, and are of two kinds, barren and fertile. The former grow to a height of from four to eight inches, and the latter to a height of from six or seven to twelve inches. In both the stipes is longer than the leafy portion of the frond, and of a very pale green, sometimes almost white. The barren fronds are bi-pinnate, sometimes in large highly developed specimens, nearly tri-pinnate. The general outline of the barren frond is triangular, broadest at the base, and somewhat bluntly pointed at the apex. Alternately placed on each side of the rachis are the pinnae, or primary divisions of the frond, and these are of the same general shape as the frond, namely, triangular. Alternately placed along the pinnae, and on each side of their mid-stems are a series of bluntly wedge-shaped pinnules, which, when they become again divided, making the frond tri-pinnate, are also bluntly wedge-shaped. The lobes—or ultimate divisions of the frond—have their outer margins deeply fringed, cleft, or serrated. The venation of the lobes consists of a tortuous mid-vein, with forked venules running from it to the segments of the lobes. In the fertile fronds the general outline and arrangement of pinnae, pinnules, and lobes are the same as in the barren ones; but the lobes or ultimate divisions of the pinnae are much contracted, in order to provide a kind of rough cover for the spore cases. The latter are borne on the venules of the lobes, and are covered by the lobe margins, which on each side are reflexed or bent under, to cover them, the edges of the lobes at first almost meeting midway; but afterwards becoming opened or thrust back, to admit of the escape of the ripened spores, which, as we have seen, have by that time run together, or become confluent at the backs of the lobes.

DISTRIBUTION.—In Europe the Parsley Fern is found in Denmark, France, Germany, Hungary, Italy, Lapland,

Norway, Spain, Sweden and Switzerland. It is also an inhabitant of the western coast of North America. In England it is found in the counties of Chester, Cumberland, Derby, Devon (in this county only one or two plants have been obtained from Exmoor), Durham, Hereford, Lancaster, Northumberland, Salop, Somerset (Exmoor being partly in Devon and partly in Somerset, the few specimens of *Allosorus crispus* found on Exmoor have been referred to both counties), Westmoreland, Worcester, and York. In Wales it is very abundant in some localities. Its habitats include the counties of Anglesea, Carnarvon, Cardigan, Denbigh, Glamorgan, Merioneth, and Montgomery. It inhabits the Isle of Man. Its habitats in Scotland are in the following counties :—Aberdeen, Argyle, Ayr, Berwick, Dumbarton, Dumfries, Fife, Forfar, Inverness, Kirkcudbright, Moray, Perth, Renfrew, Roxburgh, Ross, and Sutherland. Also in the Isles of Arran, Harris, Mull, and Skye. In Ireland it is extremely rare, a few specimens only having been gathered at Carrickfergus, in the county of Antrim ; at Black Head, in the county of Clare ; at Sleive Bignian and on the Mourne Mountains in Downshire, and on the Carlingford Mountain in the county of Louth.

CULTURE.—On the open rockery, in the garden, in the Fern house or case, or in pots, the Parsley Fern can be grown under cultivation. But wherever planted it must be well drained, and, in common with all rock or wall-growing Ferns, it will not succeed if kept too wet at the roots. Hence, the perpetually moist atmosphere of a Fern case is not so suitable for it as a shady situation on the open rockery. The soil, which should be of peat and leaf-mould, in equal proportions, with sand enough to make one-fourth of the whole, should have mixed with it lumps of brick or soft broken stone.

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9.

THE BRISTLE FERN.

Trichomanes radicans.

PLATE 6, FIG 1, PAGE 235.

If the sparkle of dripping water adds a charm to the wealth of greenery clothing the rocks in a mountain stream, there is not less of beauty when the same water, gently trickling along the stones, forming the sides of a mossy cell, tips with silver the dark green fronds of its ferny occupants as it falls upon them. Those who would see such beauty in its greatest perfection must seek an opportunity—rarely to be enjoyed, but the more enjoyable on account of its rarity—of seeing the Bristle Fern growing in its home in the land of waterfalls. This beautiful species is amongst those Ferns which require the deepest shade and the most abundant and unceasing moisture. Not merely must its rhizomas and fronds be kept soft with cool vapours; they must be bathed in vapour until it shines upon them, and rolls off in silvery drops. It will follow that the habitats of this Fern are always close to water,—so close that the air around it becomes heavily charged with moisture. It grows upon the dripping rock, over the wet surface of which its rhizomas travel, whilst its rootlets form a spreading network of filmy threads, which cling to the stony pores.

DESCRIPTION.—The Bristle Fern would be amongst the most beautiful of our native species, if only on account of

the elegant configuration of its fronds. But it possesses an indescribable charm in the pellucid and almost transparent texture of its leafy substance. The fronds grow from various points of a creeping rhizoma covered with black scales, and attain a length, according to circumstances, of from six to eighteen inches. The leafy portion is triangular in shape, the stipes being about the same length as the leafy portion, though sometimes shorter. Both are of a dark green colour. Along, on opposite sides of the rachis, the pinnæ are arranged in pairs which are longest and broadest at the lowest part of the rachis, shortening and narrowing upwards. The lowest pair of pinnæ are triangular in shape, becoming lance-shaped, or narrowly egg-shaped upwards. The pinnæ are again divided into pinnules—narrowly egg-shaped in form—and these into irregular-shaped more or less deeply-cleft lobes. The venation is most beautiful. From the mid-ribs of the pinnæ branch the mid-veins of the pinnules, and from these the venules of the lobes. These venules are several times forked, the forks or veinlets proceeding to the margins of the lobe segments. Throughout the whole of this beautiful system of veining there run leafy wings, green and pellucid in texture, along on each side of the stipes, and along on each side of the rachis, and of its branches. These green leafy wings can be readily seen, by placing a frond against the light. The pinnules, lobes, and the segments of the latter are not set out in a straight line with the mid-veins, but are very much crisped and curled, giving a beautiful appearance to the plant when growing. The fructification is produced at the ends of the ultimate veinlets of the lobes in little urn-shaped receptacles. The veinlets pass through the centre of these receptacles, becoming hair-like, and upon and around the hairy filaments are produced the spore cases. But the points of the filaments, after passing into the receptacles,

continue through them, and project beyond their outer edges, thus giving a bristly appearance to a frond fully ripe, and originating the name of this Fern. *Trichomanes* comes from two Greek words, *thrix* 'hair,' and *manos* 'soft,' and apparently refers to the hair-like bristles and to the soft-looking and delicate texture of the fronds. *Radicans* refers to the 'rooting' of this Fern from its creeping rhizoma. This species is evergreen, and is the only one which we possess of the genus *Trichomanes*, which includes Ferns having their fructification borne on the margins of their fronds, in little cup-shaped or urn-shaped receptacles, which are in reality expansions of the substance of the fronds.

DISTRIBUTION.—*Trichomanes radicans* is, on the continent of Europe, found only in Spain. But it is found in the Canary Islands, the Azores and Madeira; in the islands of the Atlantic, where it is very abundant; in India, in Jamaica, Granada, and Martinique; in Mexico, Panama, Venezuela, and Brazil. In the Pacific Ocean it inhabits Galapagos and the Society Islands. It is said that in the year 1758 it grew abundantly near the town of Bingley, in Yorkshire. But even by the year 1782 it had almost disappeared from that habitat; and there is no other part of Great Britain where it has been found. It has been affirmed that it grows not only in abundance, but with great luxuriance, in one part of Wales; but its precise habitat in that country is a profound secret, known only to a few persons. Its actually known habitats are confined to Ireland; and from the circumstance that amongst the chief of these is the neighbourhood of Killarney, has arisen the name given to this charming plant of the 'Killarney Fern.' The counties of Cork, Kerry, Limerick, Waterford, and Wicklow, are the only counties where it grows. The localities named are as follows: in the county of Cork, in Glendine Wood; at

Glenbour and Killeagh, near Youghal; at the base of a dripping rock in Temple Michael Glen, and at Ballinhasy Glen, near Cork; near Bandon; at the fall of the Clashgariff; near Glandore; in the neighbourhood of Bantry; beneath a shelf of rocks, and at an altitude extending from a thousand to twelve hundred feet on Carrigeena Kildorrery, in the north of the county. In the county of Kerry, at the Tork Waterfall, and on the Tork Mountain, in several places extending to an altitude of fifteen hundred feet; at Glengariff, on the island of Valentia; in a ravine of the Cromaglaun Mountain; on Mount Eagle near Dingle; at Gortagaree, a place lying between Kenmare and Killarney; at Blackstones, in Gloun Caragh (in this locality growing abundantly in a romantic cave); at Inveragh, and at Curaan Lake, Waterville. In the county of Limerick, on the Cumailte Mountains; in Waterford, along the valley of the River Blackwater; and in the county of Wicklow, in Hermitage Glen, and at Powerscourt Waterfall.

CULTURE.—From what has been said it will be imagined that the only method of cultivating this beautiful Fern is under glass, unless a natural condition of growth can be otherwise imitated. To obtain success Nature must be copied, as far as possible, by keeping around the plant an atmosphere constantly loaded with moisture. Exposure of the delicate pellucid fronds of *Trichomanes radicans* for a few minutes to the air, unprotected by any glass covering, will cause its fronds to dry, and commence to shrivel. The soil for case culture should be peat, leaf-mould, and silver sand, placed upon the usual drainage of broken bricks. Small or moderately-sized blocks of freestone, or soft porous sandstone should be placed about, upon, and partly embedded in the soil. Between these blocks the rhizomas of the Bristle Fern should be placed, the rootlets being covered with earth. On first planting, the rhizomas should be pegged closely down to

the soil, so that they may be firmly pressed against it, and yet be left lying *on* it. Then they must be watered gently, until the whole of the compost is thoroughly moistened, after which the glass covering must be put on, and kept close for some time. Air will very seldom need to be given, and water only occasionally, because the almost hermetically-closed glass will keep in the moisture. We have found it an excellent plan to put the Fern in a small pan, with a bell glass over it, and to cover the latter with a second and larger glass. This is a most effectual method of keeping in the moisture. The case containing it should always be kept in semi-darkness, and if all these conditions are observed this exquisite Fern may be grown with the most perfect success.

10.

THE MOONWORT.

Botrychium lunaria.

PLATE 5, FIG. 7, PAGE 225.

THE Moonwort, in general appearance, hardly realizes the idea of a Fern, although it is, in reality, one. It is mostly found on heaths, moors, or open pasture-lands, generally growing on land which is slightly elevated, and not caring for abundant moisture, although loving the dampness afforded by the roots of grass, and the shelter of grassy and other dwarf growths of vegetation. It has, indeed, been asserted—and, apparently on good grounds—that this little plant is a sort of grass parasite, feeding, in some way, on grassy roots. In any case it is a fact that it will not succeed in cultivation unless it be removed from its habitats with undisturbed roots embedded in a portion of the turf in which it was found growing.

DESCRIPTION.—Unlike most Ferns, *Botrychium lunaria* does not throw up a number of fronds from the same root. It has but one, and that a kind of double frond, which consists of a barren leafy portion, and of a seed-bearing spike. Both start from a scaly sheath of a reddish brown colour, surmounting a small, fleshy and brittle root, with fleshy rootlets. In its rudimentary state this sheath encloses the frond bud, which, as it develops, grows upwards. A little way from the rootstock it divides into two stems, a barren

and a fertile stem, the first growing away at an acute angle from the other, and developing on each side of it a row of somewhat crescent-shaped or half-moon-shaped pinnules, attached by short stems—the fertile stem continuing to grow upwards, in a line with the stalk from the rootstock, and at an inch or two above the point of division developing on each side of it alternate branches bearing alternate clusters of round two-valved spore cases, which, when ripe, are of a reddish brown colour. The stipes from the scaly sheath at the crown of the rootstock to the point from which the leafy pinna starts is, in length, somewhat less than half the entire length of the frond. The venation in the barren frond consists of a series of forked veins, nearly parallel with each other, their extremities running to the edges of the pinnules. The Moonwort is a deciduous species, the frond springing up in April, and disappearing in July; and it is a curious and interesting fact that within the stalk or stipes, and at its base, there is the immature frond—both barren and fertile branch—of the succeeding year, and within that again the frond of the third year, the latter being, of course, still more immature than that of the second. The colour of the Moonwort is a vivid green, and the texture of the plant thick. Its fronds are brittle, and succulent, reaching a length of from two or three to ten inches. Its botanic name of *Botrychium* is derived from *botrys*, ‘a cluster of grapes,’ in allusion to the—on a small scale—branches or grape-like clusters of the spore cases. *Lunaria* probably refers to the half-moon shaped pinnules on the barren branch of the frond. The Moonwort frond does not unroll like most fronds, but opens by a straight process of unfolding. *Botrychium lunaria* is the only species we possess in Britain of the genus *Botrychium*, which consists of Ferns with marginal-borne spore cases, arranged in branched clusters growing on a separate division of the frond. From the normal form of the

Moonwort just described there are three or four departures in Britain, in the shape of varieties of the species.

DISTRIBUTION.—This Fern occurs—at heights ranging from the sea level to three thousand feet above it—pretty generally throughout Europe. It is also an inhabitant of Asia, being found in the Altai, in the Himalayan, and in the Ural Mountains, as well as in Kamtschatka and Siberia. It is found in Canada, in Newfoundland, in the Rocky Mountains, in Tasmania, and in the colony of Victoria. In England it is found in the counties of Bedford, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Gloucester, Hants (including the Isle of Wight), Hereford, Kent, Lancaster, Leicester, Lincoln, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales its habitats are in the counties of Anglesea, Carnarvon, Denbigh, Glamorgan, Merioneth, and Montgomery. In Scotland it inhabits the counties of Aberdeen, Argyle, Ayr, Banff, Berwick, Caithness, Clackmannan, Dumbarton, Dumfries, Edinburgh, Fife, Forfar, Kincardine, Kinross, Kirkcubright, Lanark, Linlithgow, Moray, Nairn, Perth, Renfrew, Ross, and Wigton, as well as the islands of Bute, Orkney, Shetland, and Skye. The counties in which it is found in Ireland are Antrim, Cork, Down, Galway, Londonderry, and Wicklow. It is found in greatest abundance in England, in the counties of Stafford, Surrey, and York, and in Ireland in the county of Antrim.

CULTURE.—The simplest and easiest method of treating the Moonwort under cultivation will be found to be the most successful method of treatment. When found in its wild habitat it should be taken up bodily, with a square, thick piece of the turf in which it is growing, especial care being taken to dig down to a proper depth, so as not to cut off be-

low, or in any way injure, any portion of the rootstock, or any of the fleshy rootlets. A depth of six inches for the turf would generally be found ample for the purpose suggested. If this turf with its little plant be then fitted either into a pot upon drainage or into a little corner of the open air rockery, the only further attention it will require will be to see that the grass of the turf is kept, by proper and moderate watering—it must by no means be over-watered—and by occasional cropping, in a healthy condition. If this be done, the Moonwort will by the same process be kept in health and made to thrive.

11.

THE ADDERS-TONGUE.

Ophioglossum vulgatum.

PLATE 5, FIG. 5, PAGE 225.

THERE is a very close relationship between the Adders-tongue and the Moonwort. Our three native species, the Moonwort, the common Adders-tongue, and the Little Adders-tongue, are included as species under two genera belonging to the same order—an order which botanists call *Ophioglossaceæ*, and which includes those Ferns whose leaves are folded up in a straight manner, and do not unroll in unfolding. Their spore cases are unprovided with an elastic ring, and are two-valved. The common Adders-tongue, like the Moonwort, grows amongst grassy roots in moist meadows, heaths, or moors, springing up about the month of May, its fronds disappearing by the end of the summer. But it prefers a damper situation, and a richer and more loamy soil than *Botrychium lunaria*; and for this reason it is not found growing in situations so far above the sea level as the latter, its range not going beyond an elevation of about six hundred feet.

DESCRIPTION.—The root of the Adders-tongue is fleshy, succulent, and brittle; and like the Moonwort it produces a sort of double frond, which at the top of its stem, divides into two parts, the one leafy and barren, and the other contracted and fruitful, being nothing more indeed than a fruit-bearing spike. The leafy portion divides at an acute angle

to the stem, and the fruitful spike runs up perpendicularly, bearing its spore cases at its top. The barren portion of the frond, however, is not divided as in the Moonwort into a series of stalked pinnules, but is a simple egg-shaped or pear-shaped leaf, both stem and leaf being of a vivid green. The venation of this leaf is very beautiful, consisting of a system of anastomosing veins, forming a complete network over the substance of the leaf. The spore cases at the top of the fruit spike are ranged in a double row, one on each side of the stem, within about an inch of its apex, and they are rounded in form containing the almost impalpable dust-like spores. When the latter are ripe these cases split open transversely, and have then the appearance of a double row of teeth or of separate fangs. Hence the name *Ophioglossum*, which is derived from *ophios*, 'a serpent,' and *glossa*, 'a tongue.' The specific name *vulgatum* is applied on account of the abundance of this little Fern. The height to which the fronds grow is from three or four to about twelve inches, and the undivided stem or stipes is sometimes half the entire length of the frond, sometimes more than half, and sometimes less. No departure from the normal form of the common Adders-tongue has ever been discovered in Britain.

DISTRIBUTION.—Throughout Europe this Fern is widely distributed. It also is found in Africa, at the Cape of Good Hope; in Asia, in the Caucasian Mountains, in the East Indies, in Kamtschatka and in Siberia; as well as in North America and Mexico; in Australia and New Zealand.

In the British Islands it is most common in England; being found—sometimes in vast quantities, covering many acres of ground—in the counties of Bedford, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Huntingdon, Kent, Lancaster,

Leicester, Middlesex, Norfolk, Northumberland, Nottingham, Oxford, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, and York. In Wales it is found in Anglesea, Denbigh, and Pembroke. In Scotland, in the counties of Argyle, Berwick, Edinburgh, Fife, Forfar, Kirkcudbright, Lanark, Linlithgow, Moray, and Perth. Also in the Orkney and Shetland Isles. In Ireland it occurs in the following counties :—Annagh, Antrim, Cork, Dublin, Galway and Tipperary.

CULTURE.—The same method of culture as that recommended for the Moonwort will be found to succeed in the case of this little Fern—namely, the removal of the plant imbedded in the turf on which it is growing. But after planting it with its turfy mass of grass roots,—on which it is believed to feed,—it will need more moisture than the Moonwort, and should have a richer and more loamy soil in contact with its roots.

12.

THE LITTLE ADDERS-TONGUE.

Ophioglossum lusitanicum.

PLATE 5, FIG. 6, PAGE 225.

THIS little plant is a very diminutive relation of the common Adders-tongue. Like it, it grows amongst grassy roots, upon which, according to a well-received belief, it feeds, something after the manner of a parasite.

DESCRIPTION.—The root, rootlets, stem and frond of *Ophioglossum lusitanicum*, so much resemble a dwarfed form of the common Adders-tongue, that by some persons it has been considered merely a stunted variety of that Fern. It may fairly claim, however, the dignity of a separate species. It grows to a height of from two to four inches—root, stem, barren leaf, and fruitful spike, following just the same arrangement as in *Ophioglossum vulgatum*. But the barren leaf—sometimes there are two—is narrower and more pointed than in the latter, being seldom much more than an inch long, and the eighth of an inch broad. It is broadest at the centre, and tapers at both ends. The fruit spike is also much smaller than in *Vulgatum*, seldom containing more than five or six spore cases on each side of the spike.

DISTRIBUTION.—In Europe this plant ranges over Dalmatia, France, Greece, Italy, Portugal, Sicily, and Spain. It is found along the shores of the Mediterranean; in the islands of the Atlantic; and also on some of the African coasts, being found in particular in Algiers, at Tangier, in the island of

Madeira; and in the Azores, Canary, and Cape de Verd Islands. It is found in the island of St. Helena, New Zealand, and in Western Australia. In Britain it is stated to have been found in Cornwall, but no other habitat has been recorded—a circumstance, however, which may arise from the fact of the plant being so diminutive, occurring amongst grass, starting up into life in the frigid month of January, and disappearing from sight early in the year. It was first discovered to be a British species in the year 1854, the place of its discovery being Petit Bot Bay, Guernsey. That island is now in fact, the only British habitat which is actually known to exist.

CULTURE.—Precisely the same conditions of culture should be applied to this little plant as we have suggested for the common Adders-tongue.

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- FIG. 1. COMMON POLYPODY (UPPER SIDE OF FROND)
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2. COMMON POLYPODY (UNDER SIDE OF FROND SHOWING THE
FRUCTIFICATION)
3. MOUNTAIN POLYPODY
[*Polypodium pheopteris*]
4. THREE-BRANCHED POLYPODY
[*Polypodium dryopteris*]
5. LIMESTONE POLYPODY
[*Polypodium calcareum*]



13.

THE COMMON POLYPODY.

Polypodium vulgare.

PLATE 7, FIGS. 1 AND 2, PAGE 253.

THERE are five species of Polypody in the British Islands, and they form an interesting little group, alike in the peculiarity which is the character of the genus *Polypodium*, but differing from one another in some important respects. The characteristic of the genus *Polypodium* consists in the fact that the little heaps of spore cases on the backs of the fronds are absolutely uncovered by any protecting membrane or indusium. *Polypodium* is derived from two Greek words; *polys* 'many,' and *pous* 'a foot,' and freely rendered, means 'many footed'—the designation referring to the creeping and branching rhizomas from which the fronds of these Ferns spring, giving to some extent the idea of feet.

Polypodium vulgare, though in respect to the characters just indicated, resembling all the British species of its genus, differs from them, not only in form but in its habitats. It grows in a great variety of places, and in situations in which the other British Polypodies are never found. Its creeping rhizoma delights to revel amidst soft rich leaf-mould collected in places at almost every kind of elevation above the ground level. In forests vast numbers grow in pollard trunks, and in the forks of other trees, or close to the ground—though just raised above it—upon the decaying stumps of trees which have been felled. Numbers of these plants also

grow upon the tops and at the sides of old ruins and old walls ; in clefts of rocks ; on the sides of old bridge arches ; upon the tops of hedge-banks ; and in stony and woody hollows in the hedge-sides. It is stunted or luxuriant, according as the situation it grows in provides more or less abundantly the necessary conditions of moisture, shade, and leaf-mould. In the hedge-top, where its roots—luxuriating in the deposits of leaf-mould upon hollow woody stumps—creep under the gnarled and twisted roots of ivy or other shrubs, and revel in the dampness and shade occasioned by the sheltering vegetation above, the Common Polypody becomes a magnificent plant. But when it grows as it often does between the little crevices in a stone wall exposed to the sun and wind, the plant becomes a pigmy, and its fronds barely reach the minimum length usually assigned them.

DESCRIPTION.—The capacity for development exhibited by the Common Polypody in Britain is far greater than botanical writers have been wont to admit. The maximum length of its frond is usually given at from eighteen to twenty inches. It is perhaps not often that specimens are seen whose fronds exceed this limit. We desire, however, to put on record the fact that from the top of a shady hedge-bank in a Devonshire lane, we have gathered specimens, not once only but several times, two feet six inches in length.

The fronds, which are evergreen in sheltered situations, grow at right angles from a somewhat thick fleshy rhizoma, which branches in various directions, and is provided with an abundant mass of fibrous rootlets. The stipes, smooth, brittle, and of a whitish green, is usually about the same length as the leafy portion of the frond, but is sometimes shorter and sometimes much longer, more especially in the larger specimens already referred to. The leafy part is in

general form somewhat narrowly egg-shaped, tapering to a point, more or less blunt at its apex, broadest about the centre, and slightly narrowing towards the base. It is what is called pinnatifid, the leafy expansion on each side of the rachis—which, like the stipes, is smooth and of a whitish green—being cleft down almost close to it, having on both sides a row of blunt-pointed lobes about an inch long, and rather more than a quarter of an inch broad, fastened to the mid-stem or rachis in alternation, and by the whole width of their bases. Through each lobe runs a tortuous and somewhat rigid and prominent mid-vein, from both sides of which radiate three or four times branched venules, most of them terminating in little club-shaped heads close to the margins of the segments or lobes. Some of these club-headed venules, however—and one at least on each of the forked series—terminate midway between the mid-vein and the lobe margin, and upon these shorter venules in the fruitful lobes are borne the sori. There is thus a double row of the sori on each lobe, one on each side of the mid-vein. The sori are round, light straw-coloured when young, then yellow, and finally orange-coloured. They are mostly confined to the upper half of the under side of the frond, and when ripe and ranged, as they often are, in closely-set lines, they give to the frond an extremely beautiful appearance. There are about forty varieties in the British Islands of the normal form of *Polypodium vulgare*.

DISTRIBUTION.—Like most of the British species of Ferns, *Polypodium vulgare* is distributed pretty widely through European countries, being an inhabitant of Corfu, France, Germany, Italy, Sardinia, Scandinavia, Sicily, Spain, and Switzerland. In Asia, it occurs in Armenia and Kamtschatka. In Africa, in Algiers, the Canary Islands, and Madeira. It is found in the United States of America, in Canada, Guatemala, and Mexico. In the British Islands

it is found almost everywhere, being pretty equally distributed throughout Great Britain, Ireland, and the Channel Islands.

CULTURE.—In open rockwork, or in any part of the Fern garden, elevated situations are the best for this Fern. It must be kept moderately moist at its roots, but they should have good drainage. The soil should be leaf-mould and sand or sandy loam, and there should be plenty of room for its rhizomas to travel. In planting them they must not be covered with earth, but merely pressed down into the earth, so that about half their circumference is covered, the rootlets only being embedded in the soil. Shade, coolness, and shelter from cutting winds are essential in its cultivation out of doors. Great depth of soil is not necessary. In shallow pots also *Polypodium vulgare* may be grown very successfully, and under glass in the Fern house or the Fern case, although, from its hardy nature, it lives and will thrive better in the freedom of the outdoor fernery. If it be desired to increase this Fern by division, this can be easily accomplished by cutting the rhizomas into pieces, taking care that each piece has a little mass of rootlets and one or two fronds or frond buds.

14.

THE MOUNTAIN POLYPODY.

Polypodium phegopteris.

PLATE 7, FIG. 3, PAGE 253.

THE specific name of this Fern is derived from two Greek words—*phegos*, ‘a beech,’ and *pteris*, ‘a fern;’ and hence the reason why it is frequently called ‘the Beech Fern’—a name which appears to have puzzled botanical writers. It is probable, however, that the somewhat spreading and miniature tree-like appearance of the fronds of this little Fern, taken in conjunction with its whitish-looking stipes and the whitish downy-looking green of its fronds, may have suggested a resemblance to the beech-tree and its white wood. But its name of Mountain Polypody is the more suitable, if less fanciful, designation. It is a far more delicate species than *Vulgare*, seeking much moister habits than that Fern, its fronds disappearing on the first approach of winter, and the plant remaining dormant until somewhat late in the succeeding spring. On the margins of mountain streams; in damp woods; sometimes growing on the earthy crevices of stony and sheltered hedge-banks, or in moist nooks amidst the rocks of a quarry, this Fern is found. It loves especially the neighbourhood of waterfalls, or any situation where it can come within the influence of the spray of dashing water.

DESCRIPTION.—From very slender and extensively creeping rhizomas—far less robust than those of *Polypodium*

vulgare—start a number of delicate-looking, pale-green fronds reaching a length of from six to twenty inches. The frond has a long stipes, pale green, slender, and brittle, and generally double the length of its leafy portion, which is triangular in form. Arranged in pairs on each side of the rachis are long tapering pinnae. The lowest pair is usually the longest, and succeeding pairs become shorter and shorter, until they are merged in the apex of the frond. The two or three basal pairs are, usually, distinctly pinnate, being attached to the rachis by the whole width of their bases. But above these lower pairs the pinnae are run together by a sort of leafy wing, which connects them with the pinnae above and below them. The basal pinnae are again partially divided into blunt-pointed lobes or segments, the indentation forming the lobes being deeply cut in, but not extending quite down to the mid-stems of the pinnae; the clefts being, however, deepest in the middle of the lowest pairs of pinnae, and becoming gradually less towards the apices of the latter—which are somewhat sharp pointed—until they disappear in the leafy tips. The venation consists of wavy mid-veins running down the lobes of the pinnae, with venules branching off from them on each side towards the lobe margins, the venules being sometimes simple and sometimes forked, and bearing at their extremities the circular heaps of uncovered or non-indusiate spore cases. The fructification is thus what is called marginal or nearly so, the sori extending in little lines on each side of the mid-veins of the lobes, but not proceeding quite to the apices of the latter. Nearly the whole under side of the frond is covered with the fructification.

Two peculiarities about this Fern must be noticed. The upper pinnae on the fronds are narrowly lance-shaped, broadest at their bases, and tapering to their apices. But in the lowest pairs of pinnae the latter taper somewhat also

towards their bases—the lowest pair of all, instead of standing out horizontally from the rachis, being bent downwards at an obtuse angle as if drooping. Over the leafy surface of the fronds there are scattered numerous white hairs—easily seen by the aid of a glass and even by the naked eye—giving a mealy or somewhat frosted appearance to this plant.

DISTRIBUTION.—Throughout Europe, in parts of Asia, and in North America the Mountain Polypody is found. In England its habitats are in the counties of Chester, Cornwall, Cumberland, Derby, Devon, Durham, Gloucester, Hereford, Lancaster, Northumberland, Salop, Stafford, Sussex, Westmoreland, and York. It is found also in the Isle of Man. In Wales it inhabits the counties of Brecknock, Carmarthen, Carnarvon, Cardigan, Denbigh, Glamorgan, Merioneth, Montgomery, and Radnor: in Scotland, the counties of Aberdeen, Argyle, Berwick, Clackmannan, Dumbarton, Dumfries, Edinburgh, Fife, Forfar, Inverness, Kincardine, Kirkcudbright, Lanark, Perth, Renfrew, Roxburgh, Ross, Stirling, Sutherland, and the islands of Cantire, Islay, Mull, Orkney, and Shetland. In Ireland it is, generally speaking, an uncommon species, and is local in its distribution; occurring in the following counties:—Antrim, Donegal, Down, Galway, Kerry, Londonderry, Louth, and Wicklow.

CULTURE.—Above all things perfect shade and abundant moisture are needed by the Mountain Polypody under cultivation. From its predilection for moisture it makes a good Fern for the case or Fern house. When in a pot the latter should be kept in a saucer containing water, care being taken that the water is not allowed to become stagnant. In the open rockery it must have a very shady and cool place, and if its rhizomas can have the advantage of a trickling stream of water, or can be placed under the spray

of a fountain, the circumstance will greatly conduce to its vigorous growth. The soil should be leaf-mould and peat, in the proportion of two parts of the former to one part of the latter, together with an admixture of sand or light sandy loam equal to one-fourth of the whole. The little caudices of this Fern should be very lightly covered with a thin surface of earth when first planted, on account of their small size and the difficulty of otherwise keeping them in their proper position. So soon, however, as they have become established the waterings given from time to time will have washed the earthy coverings from the rhizomas, and the latter will then be in their natural position—partly in, instead of quite underneath, the soil. By division of the rhizomas this Fern can, like the other Polypodies, be multiplied.

15.

THE THREE-BRANCHED POLYPODY.

Polypodium dryopteris.

PLATE 7, FIG 4, PAGE 253.

AMONGST our native Polypodies this species is unquestionably the most delicate in form and habit, as well as the most beautiful in colouring. Yet this tender little Fern takes one of its names from a forest tree—*dryopteris* being derived from *drus*, ‘an oak,’ and *pteris*, ‘a Fern.’ It is indeed frequently called ‘the Oak Fern,’ on account of some not perhaps entirely fanciful resemblance, in miniature, of the frond to an oak-tree. It is found in very much the same kind of situations as *Phegopteris*, namely, in damp woods, in moist mountainous districts, in stony hedge-banks, and on the margins of moorland streams. But in such places it selects a somewhat drier position than *Phegopteris*, though it equally avoids the sunlight, which would prejudicially affect the delicate texture and colouring of its beautiful fronds.

DESCRIPTION.—It would be by no means inapt to compare generally a frond of *Polypodium dryopteris* to three crossed fronds of *Phegopteris*—one placed in a perpendicular position and the other two at right angles to it, with their stalks or stipides in a line. The description is, of course, not an exact one, but it gives a general idea of the form of the frond, which, as its fairly descriptive name implies, is distinctly three-branched. According to the conditions of growth, the fronds of this little Fern grow to a length of

from six inches to a foot. They start from a thin, blackish, and extensively creeping rhizoma, the stipes—usually twice the length of the leafy portion—being smooth, pale green, and brittle. The colour of the fronds in their early stage is a delicate golden green—which becomes darker as they become older—and they consist of three branches standing nearly at right angles to one another, the upper one of the three—that carried on a continuation of the primary rachis—being the largest. Between the leafy portion of each branch and the point where at the top of the stipes they join, there is a clear space of stem. In the unrolling of the frond from the point of junction of the branches, the latter, before they are unfolded, present a curious appearance, like three little green balls on green wires. Each of the three branches when unfolded is triangular in shape; pinnate at its base, and pinnatifid towards its apex, the pinnules set on its mid-stem in pairs, becoming shorter and shorter, and finally merging in an obtuse point. The basal pinnules of the branches are deeply cleft or pinnatifid, the lobes into which they are divided being oblong and blunt pointed. Whilst the pinnules on the uppermost of the three pinnae or branches are equal in length, the pinnules of the two lower pinnae below the rachis or mid-stem of the branches are longer than those above it. At the point where the three branches are united the stem is thickened, giving the appearance of a little knot. The venation of the pinnules consists of a wavy mid-vein with alternate venules proceeding on each side of it to the margin, sometimes simple and sometimes forked, and bearing upon them near the margins of the pinnules the little light-brown, or sometimes golden, heaps of spore cases, arranged either in lines on each side of the mid-stems of the pinnules or on each side of the mid-veins of the lobes, according to the small or large size of the frond, and the development of its parts.

DISTRIBUTION.—The range of this Fern is pretty general throughout the countries of Europe. It does not occur in Greece and Turkey. It is found in Asia, in Africa, and throughout North America. In England it is found in the counties of Chester, Cumberland, Derby, Devon, Durham, Gloucester, Hereford, Lancashire, Lincoln, Monmouth, Northumberland, Oxford, Salop, Somerset, Stafford, Sussex, Warwick, Westmoreland, Worcester, and York. In Wales it is plentifully distributed, occurring in Anglesea, Brecknock, Carnarvon, Cardigan, Denbigh, Flint, Glamorgan, Merioneth, Montgomery, and Radnor. In Scotland its habitats are in the counties of Aberdeen, Argyle, Berwick, Clackmannan, Dumbarton, Dumfries, Edinburgh, Fife, Forfar, Inverness, Kincardine, Kinross, Kirkcudbright, Lanark, Nairn, Perth, Renfrew, Roxburgh, Ross and Sutherland, as well as in the Isles of Arran and Mull. In Ireland it is much more rare, specimens having been found in only four counties, namely, Antrim, Down, Galway, and Kerry.

CULTURE.—The creeping rhizoma of this Fern is very enterprising, running laterally in every direction on the Fern rockery not bounded by a rocky barrier, and throwing up as it goes its delicate little fronds. The soil should be leaf-mould, peat, and very light sandy loam, mixed in the proportion of two parts of leaf-mould, two of peat and one of sandy loam. But it must be kept in the coolest and shadiest of nooks, and plentifully supplied—though not drenched—with water. Its fresh golden green fronds are an acquisition to the open-air rockery, where it will grow boldly. In the Fern house, or case, or garden, too, it will grow admirably, as well as in pots, where, however, it needs room to spread more than a great depth of soil. In planting, the rhizomas must be very lightly covered with soil, until they have become established.

16.

THE LIMESTONE POLYPODY.

Polypodium calcareum.

PLATE 7, FIG. 5, PAGE 253.

THE Limestone Polypody is much hardier and more robust than *Dryopteris*. Its botanical name of *Calcareum* is exactly adapted to the character of this Fern, which loves to grow in moist crevices amidst limestone rocks, or on soils in limestone districts. It does not seek the same deep shade as *Dryopteris*, and its fronds, from their less delicate texture and colouring, can better withstand the effects of sunshine than the golden green fronds of the 'Oak Fern;' yet the shadier the nook on earth-bank or rockery, the more finely developed will be the fronds of *Calcareum*, and the deeper will be their tinge of green.

DESCRIPTION.—There is some resemblance between *Calcareum* and *Dryopteris*, in so far only, however, as the general shape of the frond is concerned; but there are several unmistakable points of difference. In the first place, *Calcareum* is a larger plant, growing from eight or nine inches in height to a maximum of eighteen inches and more. The stipes of the frond—though like that of *Dryopteris*, usually longer than the leafy portion—is stouter on account of the more vigorous development of the plant. The colour of the frond, which is triangular in shape, is not a golden green, but a kind of bluish green, having an appearance sometimes as of a bluish powder scattered over green

leaves. The pinnæ are not three-branched, and the principal rachis in continuation of the stipes upwards is stouter than the rachides of the largest pair of pinnæ—the lowest on the frond. In *Dryopteris* the rachis of each branch is of the same thickness, and this, taken in connexion with the greater proportionate development, and the more distinct character of the lowest pair of pinnæ, gives the decided three-branched appearance to that species. In *Calcarum* the fronds may be described as being bi-pinnate—in large specimens, tri-pinnate in their lowest pinnæ. The lowest pair of pinnæ set on nearly at right angles to the principal rachis are narrowly triangular, pinnate—sometimes bi-pinnate at their bases—pinnatifid towards their apices, the lower pinnules on their mid-stems being longer than the upper ones, and again divided, or deeply cleft, at their bases, into lobes, but merely notched towards their apices. The pair of pinnæ next above the lowest pair are more narrowly triangular, pinnate at their bases, pinnatifid higher up; the pinnules—where pinnate—attached to the mid-stems of the pinnæ sometimes by very short stalks, and having their margins serrated, the lower pinnules being only slightly longer than the upper ones. The next and succeeding pairs of pinnæ become narrower and narrower, and less and less divided, until they finally run together at the apex of the frond. The venation is almost identical with that in *Dryopteris*, and consists of a wavy mid-vein, with alternate, sometimes simple and sometimes forked, venules, bearing small uncovered or non-indusiate heaps of spore cases, which are evenly distributed over the under side of the pinnules, or lobes; sometimes becoming almost confluent along the lobe margins, and then giving to the fronds a miniature resemblance to the Bracken when its fructification is ripe. This resemblance is made the greater from the fact that the lobe margins are a little curled

under, giving a concave appearance to the back of each lobe. The whole frond, indeed, has a curious general resemblance to a Bracken frond in miniature. One feature which further helps to make this species distinct from *Dryopteris* (though some botanists merely regard it as a variety of the latter), must be noticed. There is not, as in *Dryopteris*, the curious appearance of three little green balls when the pinnae are unrolling, for each pinna separately unfolds. The rhizoma creeps extensively, and is provided with abundant fibrous rootlets. There are no variations from the normal form of *Calcareum*.

DISTRIBUTION.—In Europe the range of this Fern extends to France, Germany, Hungary, Norway, and Switzerland. The species inhabits also the Himalayan Mountains, the United States of America, and Canada. In England it is found in the counties of Cumberland, Derby, Durham, Gloucester, Hereford, Lancaster, Oxford, Somerset, Stafford, Westmoreland, Wilts, Worcester, and York. In Wales it occurs in the counties of Brecknock, Carnarvon, Denbigh, and Glamorgan. In Scotland it is extremely rare. From Ireland it is altogether absent.

CULTURE.—Wherever cultivated, whether on the open rockery, in pots, in cases, or in the Fern house, it is always beneficial to place amongst the soil—which should consist of leaf-mould, and sand and loam in equal quantities—little blocks of limestone, the caudices of the Fern being placed between the blocks of stone. We have seen that this Fern does not require the deep shelter which *Dryopteris* demands; but if well shaded in a nook at the foot of the rockery, it will become more grandly developed than if exposed in sunny places. It is a very hardy species, may be readily multiplied by a division of its branching rhizomas, and will creep extensively wherever planted.

17.

THE ALPINE POLYPODY.

Polypodium alpestre.

PLATE 9, FIG. 2, PAGE 301.

It was not until the year 1841, that this Fern was discovered and added to the list of the British flora; it having been previously overlooked or mistaken for a variety of the Lady Fern (*Athyrium filix-femina*). Since its discovery, British botanists have been engaged in discussions as to the position which it should take amongst the species of our native Ferns. Some of them think it should rank as a variety of the Lady Fern, whilst others, and these the majority, include it amongst the Polypodies. If the character which has originated the name *Polypodium*,—‘many footed,’—were regarded as the distinguishing mark of that genus, this Fern could not be included within it. But the distinguishing mark in the genus *Polypodium* is the absence from above the circular clusters of spore cases of indusia; and as the spore cases in the Lady Fern have very distinct indusia, and the present species is without these coverings, whilst the grouping of the spore cases into little round heaps closely resembles the arrangement in the Polypodies, it is clear that there is good ground for including this species under the genus *Polypodium*. Under cultivation, it appears that some plants of *Polypodium alpestre* have been discovered to possess something like indusia covering their sori. These, however, have been in such cases regarded rather as abnormal developments of the

receptacles—those parts of the system of veins to which the sori are attached—than as real indusia. Growing wild, it is found in damp mountain gorges amongst rocks, as well as in higher and more exposed situations.

DESCRIPTION.—From a short erect caudex, the fronds rise in tufts. They are somewhat broadly lance-shaped, the leafy portion tapering to the apices, and also, though in a less degree, towards the base. In length they range, according to circumstances, from a foot to three feet and a half, having stems or stipides much shorter than their leafy portions, and furnished with a few light brown scales. Along the rachis of the frond the pinnae are arranged in alternation, in form somewhat spearhead-shaped, and divided into blunt-pointed pinnules, which in small plants are deeply notched or serrated, and in large and finely developed plants are divided almost down to the mid-veins. The venation in the pinnules consists of the mid-veins just referred to, which are somewhat wavy, and of forked venules branching into the lobes or serratures of the pinnules, bearing the sori near their extremities and mostly close to the inner margins of the lobes. There are four or five varieties of this Fern.

DISTRIBUTION.—*Polypodium alpestre* is widely spread throughout the countries of Europe. Its resemblance to the Lady Fern is at first sight so close that to fix its range in Europe as well as in other parts of the world has become a matter of some difficulty. Its presence, however, has been undoubtedly discovered in Germany, Lapland, Norway, Russia, Sweden, and Switzerland. In the British Islands its presence has as yet only been discovered in Scotland, in the counties of Aberdeen, Forfar, Inverness, and Perth, occurring on mountain ranges up to a height of nearly four thousand feet above the sea level. Its first discoverer, Mr. Watson, found a specimen of it, from which he gathered two fronds, in July, 1841. This was in the great corrie of Ben Alder, a

lofty mountain situated on the west side of Loch Erricht, in Inverness-shire. Subsequently a specimen was found at another spot in the neighbourhood of Loch Erricht, probably as Mr. Wilson suggested, on the hills between Ben Aulder and the north end of the lake, but he added that it might be on the hills of Drumochter Forest, eastward of the lake, and in that case the station would be within Moray or Eastern Inverness. In 1844, Mr. Watson found a specimen in Canlochen Glen in Forfarshire. But after this, and when the Fern came to be no longer confounded with the Lady Fern, it was found in vast quantities, being abundant in, amongst other places, Glen Canlochen, Glen Prosen, and Glen Fiadh, and in all the corries of the Deeside mountains, and the mountains of the neighbouring districts. It is somewhat curious to find from the statements made by its first discoverers, that up to an altitude of from two thousand to three thousand feet it was found growing in company with the Lady Fern. But that when the Lady Fern had reached its highest range at three thousand feet, and was no longer found, *Polypodium alpestre* still continued to be found up to an altitude of nearly four thousand feet, growing in vigorous abundance, and more vigorous in open and exposed situations than in damp and protected places.

CULTURE.—The cultivation of this Fern presents no difficulties whatever. It will grow readily—in a mixture of peat and loam—in the open rockery or in the Fern house. But it must be well drained.

18.

THE HARD PRICKLY SHIELD FERN.

Polystichum aculeatum.

PLATE 8, FIG. 3, PAGE 293.

THE British Shield Ferns constitute a small but beautiful group, possessing some very distinctly-marked characters which at once serve to make them recognizable. The generic name of *Polystichum* is derived from two Greek words. *polys*, 'many,' and *stichos*, 'order;' and refers to the numerous lines of spore cases on the backs of the fronds of these Ferns, and to the regular order in which they are arranged. It no doubt also refers to the regular order of the pinnules in this Fern. The specific name of *aculeatum*, 'prickly,' serves to distinguish the present Fern from the rest of the group, referring as it does to its more rigid and prickly nature. The common name of Shield Fern—represented by the old botanical name of *Aspidium*, which was the generic designation of a larger group, including amongst others what are now the Shield Ferns, the Buckler Ferns, and the Bladder Ferns—refers to the mark which in the modern system of classification distinguishes this genus from others. This mark is the round, or shield-shaped indusia, which cover the round heaps of spore cases on the backs of the fronds, and are attached to the latter by little stalks in the centre, and on the under side of the scaly shields. *Polystichum aculeatum* grows on the steeper sloping sides of wooded hills, and on the sides of sloping

hedge-banks in shady lanes. Occasionally, seedling plants may be found growing on the sides of walls; but it is under the deep shelter of over-arching trees, in a spreading wood, that it attains its finest development.

DESCRIPTION.—From a stout and tufted rootstock, this Fern throws up a circlet of stout, rigid, and leathery textured dark-green fronds, which attain a height, according to circumstances, of from two to four feet. They are narrowly lance-shaped, tapering to a point at the apex, and tapering also towards the base of the frond. The stipes is considerably shorter than the leafy portion, and is furnished with densely-packed dark reddish-brown scales. Alternately, on each side of the rachis, are somewhat short, lance-shaped pinnæ tapering to a point at their apices, and having on each side of their mid-stems, above and below, a row of somewhat wing-shaped pinnules attached by their bases, narrowed to a point, to the mid-stems of the pinnæ. These pinnules are set on obliquely, their apices pointing outwards towards the tips of the pinnæ, and sharply toothed or spurred at their outer edges; their inner edges, however, next to and running in an oblique direction from the mid-stems of the pinnæ, being smooth. Sometimes the pinnules are what is called decurrent, that is, run together at their bases. This is always the case towards the tips of the pinnæ, and more or less so nearer their bases; though, in finely-developed plants, the basal pinnules are attached to the pinnæ by short stems. The pinnules become smaller towards the apices of the pinnæ, as the latter taper to a point. But it is curiously characteristic of this Fern, that the upper pinnule at the base of each pinna next the principal rachis is always much larger, being both longer and broader than any of the others, and its apex frequently overlaps the base of the upper pinnule on the pinna next above it. One principal mark of distinction between *Aculeatum*

and the following species *Angulare*—the plants in some respects are so similar as to be frequently confounded—consists in the rounding of the outer edges of the pinnules, which are not angular, as are the pinnules of *Angulare*. Further marks of distinction between this species and *Angulare* are found in the more rigid and prickly looking habit of *Acutatum*, the darker green of its shining fronds and their more leathery texture. The venation consists of a mid-vein through the centre of each pinnule, with alternate branched veins upon which are borne the round clusters of spore cases. These are usually found ranged in short lines along on each side of the mid-veins of the pinnules. Each cluster is covered by a round indusium attached by a short stem on its under side. The fructification, however, is usually confined to the upper half of the backs of the frond. There are about twenty variations from the normal form of this handsome Fern.

DISTRIBUTION.—The Hard Prickly Shield Fern has a wide range throughout Europe, occurring in Austria, Belgium, France, Germany, Greece, Holland, Portugal, Russia, Scandinavia, Spain, Switzerland, and Turkey. It is found in the Island of Madeira, in the north and in the south of Africa, in Asia, and—though somewhat rare—in North America. In England it occurs in the following counties, namely:—Bedford, Berks, Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Lincoln, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. It is found also in the Isle of Man. In Wales it is distributed through the counties of Anglesea, Brecknock, Carnarvon, Carmarthen, Denbigh, Glamorgan, and

Pembroke. In Scotland through the counties of Aberdeen, Argyle, Berwick, Dumfries, Edinburgh, Elgin, Fife, Forfar, Kincardine, Kirkcudbright, Lanark, Nairn, Perth, Renfrew, Ross, and Sutherland, as well as through the Isles of Bute, Cantire, and Islay. In Ireland it is found in the counties of Antrim, Clare, Dublin, Galway, and Wicklow.

CULTURE.—Owing to its evergreen character, and to its very hardy nature, this handsome Fern is admirably adapted for cultivation on the open rockery. It can withstand the influence even of smoke and dust, and if well watered and kept in a shady position, it will, in time, become a grand plant. The soil for it should consist of sandy loam, peat, and leaf-mould, mixed in equal proportions. The fronds out of doors can withstand the frosts of ordinary winters. In-doors, whether in pots, or in the Fern house, *Polystichum aculeatum* will also thrive admirably. Indeed it is one of the most manageable and easily cultivated of our native Ferns.

19.

THE SOFT PRICKLY SHIELD FERN.

Polystichum angulare.

PLATE 8, FIG. 1, PAGE 293.

THE most familiar as well as the most gracefully beautiful of our British Shield Ferns is *Polystichum angulare*. It excels, not only in a wealth of vivid green, sometimes blended with golden hues, but in mellower tints of richest brown. It excels, too, amongst British Ferns in the beautiful and perfect arrangement of the pinnæ and pinnales of the fronds. Indeed, it is probable that it is this species which has especially claimed for its genus the name of *Polystichum*—the derivation of which has been previously explained—for the order and regularity of its multitudinous pinnules are strikingly beautiful. *Polystichum angulare*—or, as it might be appropriately called the angular-lobed *Polystichum*—is pre-eminently the Fern of the hedge-row. Its most favourite habitats are the sloping hedge-banks and the hedge-tops of moist and shady lanes. It often attains grand proportions on the steeply-sloping sides of the earthy or stony banks which border deep and sheltered ravines in moorland districts, in such a position throwing out its fronds in shuttlecock form around its central crown. We have often seen the whole of a hedge side densely clothed with the graceful fronds of *Polystichum angulare*. It is necessary to see in order to appreciate a sight so extremely beautiful.

DESCRIPTION.—There is so much general similarity between this Fern and *Aculeatum* that it will be especially necessary to indicate the points of difference which will enable the one to be distinguished from the other. Like *Aculeatum* the fronds of *Angulare* grow from a short, tufted rootstock. They are lance-shaped, tapering to the apex, and tapering also somewhat towards the base, although not quite to the same extent as in *Aculeatum*. The stipes is also short, being about one-fourth of the length of the leafy portion, though it is occasionally much longer, not unfrequently being equal in length to the leafy portion. Like *Aculeatum* the pinnæ are long, narrow, and placed alternately on each side of the rachis, tapering to a point; but, unlike it, the basal pinnules are mostly equal in size, and neither of them is larger than the rest. Neither are the pinnules rounded from the base upwards on the outer side, and attached by their bases to the mid-stems of the pinnæ. They are distinctly stalked, or attached to the mid-stems of the pinnæ by short stems. They are angular in shape—hence the name of this species—or perhaps they may be described more accurately as being wing-shaped or ear-shaped,—and joined to the stems by the convex side—towards the main rachis—of their broadest part. The pinnules which are attached to the pinnæ alternately on each side of their mid-stems, decrease in size towards the apices of the pinnæ, being at the extreme points of the latter decurrent, or run together. Their margins, except at their bases, are serrated and spinulose, or set off with soft bristles. The venation consists of the mid-veins of the pinnules, from which there are alternately branching venules, bearing the sori, or round clusters of spore cases, which when ripe are of a rich brown colour, each cluster covered by its round indusium attached at the centre on its under side by a round stalk. The sori are ranged in closely-set lines on each side of the mid-veins of the pinnules, and

when fully developed they almost entirely cover the under side of the upper half, or upper two-thirds of the fronds. One of the principal distinguishing peculiarities of *Polystichum angulare* is the abundance of its rust-coloured scales, which ordinarily densely clothe the stipes, and extend not only along the back of the primary rachis, but along the secondary rachides, or mid-stems of the pinnae. The fronds of this Fern when it is finely grown and well developed, are very compactly arranged in a circle around its crown, and sometimes the stipules thus arranged are so closely set as to present the appearance of a circular hollow densely clothed with scales. *Angulare* is distinguished from *Aculeatum* by this excess of richly coloured scales, and also by the more vivid green and the more lax and graceful droop of its fronds. It is an evergreen Fern, its fronds enduring through the winter in moderately sheltered situations. There are no less than two hundred and fifty more or less well marked varieties of this Fern.

DISTRIBUTION.—Abroad *Polystichum angulare* is found in France, Greece, Italy, Norway, Spain, and Sweden. In Africa it inhabits Abyssinia and Natal, as well as the Azores, the Canary Islands, and Madeira. It is also found in India, in the United States of America, in Mexico, in the Caraccas, in New Granada, in Guatemala, and in Java. In England it is found in the counties of Chester, Cornwall, Derby, Devon, Dorset, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Huntingdon, Kent, Lancaster, Leicester, Middlesex, Norfolk, Salop, Somerset, Stafford, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. It inhabits the Isle of Man, Jersey, and Guernsey. In Wales it is found in Anglesea, Brecknock, Carnarvon, Cardigan, Denbigh, Glamorgan, Pembroke, and Radnor. In Scotland it is rare—only occurring in the counties of Argyle and Berwick. In Ireland it inhabits the counties of Antrim.

Clare, Cork, Dublin, Galway, Kilkenny, Tipperary, Waterford, and Wicklow. It is also an inhabitant of the Arran Isles.

CULTURE.—Precisely the same method of culture should be adopted for *Polystichum angulare* as for its relative *Aculeatum*. It is a most beautiful and appropriate Fern for the shady rockery.

20.

THE HOLLY FERN.

Polystichum lonchitis.

PLATE 8, FIG. 2, PAGE 293.

THE regularity and simplicity of form and rigidity of texture of this evergreen Fern render it a somewhat striking object. It is the rarest of our native Shield Ferns, occurring in only a few localities in the British Islands. Some general resemblance of its pinnules to holly leaves—having regard more especially to the spiny, prickly nature of those leaves,—has suggested for this species the common name of the Holly Fern. Its botanical name of *lonchitis*, which means spear-like, applies to the general—narrow and pointed—shape of its fronds. It is in reality a rock Fern, and occurs chiefly at elevations of from twelve hundred to three thousand feet and more above the sea level, at such elevations being often found growing in rocky fissures on bleak mountain ranges.

DESCRIPTION.—The general form of this Fern may not inaptly be roughly likened to a single pinna of *Angulare*, its fronds being simply pinnate, having a very short stipes, and a row alternately placed on each side of its rachis of wing-shaped pinnules. Each pinnule is attached at the lower side of its base to the rachis by a narrow point consisting of the base of the mid-stem and a very small portion of the leafy substance of the pinnule. There is therefore no distinct stem to the pinnules. The fronds rise from a tufted and scaly root-

stock, and are generally from six to eighteen inches in length, sometimes reaching a length of two feet. In shape they are narrowly and sharply lanceolate, tapering to their apices, broadest towards the centre, and tapering also to their bases, where the pinnules are reduced to tiny leafy expansions. Along the whole length of the rachis are scattered, more particularly on its under side, a number of pointed, light-brown scales, which are thickly clustered at the lower part of the rachis. Sometimes the upper part—next the rachis—of the base of each pinnule—the part which, expanded upwards in the form of a lobe, gives to the somewhat crescent-shaped outline of the pinnule its distinct wing-shaped appearance—projects beyond the base of the pinnule above it, thus causing an overlapping of the pinnules throughout the frond. The edges of all the pinnules are sharply serrated, or set with spiny teeth, giving a prickly look to the entire frond, the colour of which is a light green. The venation consists of a mid-vein in each pinnule, with numerous forked venules, extending to the margin, and bearing the clustered spore cases, each cluster being circular and covered by a circular indusium attached to the pinnules by a short stalk at the centre of its under side. The fructification is usually confined to the upper half of the frond, the sori being arranged in lines on each side of the mid-veins of the pinnules, the two lines becoming sometimes almost confluent, and when the indusia have fallen off turning to a rich brown colour, and adding to the beauty of the frond. There are three variations of the normal form of this species.

DISTRIBUTION.—This Fern is found very generally throughout Europe, being an inhabitant of Denmark, France, Germany, Greece, Hungary, Iceland, Italy, Lapland, Russia, Spain, Sweden, and Switzerland. It is also an inhabitant of Asia Minor, of Kamtschatka, of the Altai Mountains, and of the continent of North America. In England it has only been

found in three counties, namely, at Fairfield, Helvellyn, in the county of Cumberland; in the county of Durham, on the Falcon Clints, Teesdale, about ten miles to the west of Middleton, as well as on the Mazebeck Scar; in Yorkshire on the Attermire Scar, at Giggleswick, at Ingleborough, and at Langeliffe, near Settle. In Wales it has been found in the following places, namely, in Carnarvonshire, at Clogwyn-y-Garnedd, at Cwm-Idwal, at Glyder-Vawr, in the district around the pass of Llanberis, and at Twll-du. It has also been found in Glamorganshire. In Scotland it has been found in the county of Aberdeen; in Argyleshire; in Dumbartonshire; in Forfarshire on the Clova Mountains, at Canlochen, on Craig Maid, in Glen Isla, in Glen Dole, and in Glen Fiadh; in Inverness-shire, in the mountainous district near Loch Erricht; in Morayshire; in Perthshire, on Ben Chonzie, near Crieff, on Ben Lawers, on Ben Voirlich, on Craig Challiach, and in Glen Lyon; in Ross-shire, on the Raven Rock, near Castle Leod; on Ben Hope, and at Assynt, in Sutherlandshire; in the Isle of Mull, on Ben More; and on Hoy Hill, in the Orkney Islands. In Ireland it is found in a glen to the east of Lough Eske, on the Rosses, and on the Thanet mountain passes in the county of Donegal; on Brandon Hill, in Kerry; on the Glenade Mountains, in the county of Leitrim; at Navan, in the county of Meath; and on the Ben Bulbin mountains in Sligo.

CULTURE.—This is a Fern which it has been said is very difficult to cultivate; and one reason alleged for this is that it is not easy to imitate the conditions under which it grows in a wild state. Being a mountain Fern, it grows at considerable elevations, where it is subjected to less atmospheric pressure than it gets when grown at a lower station. There may be some force in this suggestion. We have, however, seen *Polystichum lonchitis* grown very successfully in the

open garden, in a district having no particular elevation ; and it is probable that where success in its cultivation has not been obtained, the result is due rather to other causes than to the pressure of the atmosphere. If in other respects Nature be closely copied, and care be taken in planting the Holly Fern to place the caudex firmly between pieces of stone or rock, either in the open rockery, the Fern house, or in pots, and if the soil be a mixture of peat and sandy loam in equal proportions, with leaf-mould equal to one-fourth of the compost, and the position selected be cool, and moist, and shady, there is no reason why success should not attend the cultivation of this Fern.

21.

THE BRITTLE BLADDER FERN.

Cystopteris fragilis.

PLATE 5, FIG. 4, PAGE 225.

A SMALL but very beautiful group is formed by our British Bladder Ferns. The common name is neither euphonious nor poetical, and the botanical name is but a literal rendering of its English designation. The word *cystopteris*, in fact, comes from two Greek words, *kystos*, a bladder, and *pteris*, a Fern. *Fragilis* translates itself, and as applied to the present species, refers to the brittle, or fragile, and peculiarly herbaceous nature of the fronds of this little plant. The generic name has reference to the peculiar character of the indusia or coverings of the spore cases. In the *Cystopteris* group these organs, which are roundish in shape, are raised over the sori in the form of hoods or bladders. Hence the name of the genus, which, however, was formerly, in company with the two genera of *Polystichum* and *Lastrea*, included under the genus *Aspidium*. *Cystopteris fragilis* may be described as a rock-loving Fern, its favourite habitats being the moist and shady clefts and crevices of limestone rocks, but it is sometimes found growing on buildings, such as church and garden walls.

DESCRIPTION.—The rootstock of this beautiful Fern is tufted, having fibrous rootlets, the crown being composed of a little nest of incipient or unrolled fronds, from six inches

to twelve or fourteen in height, according to circumstances of growth. But the root of this plant has a spreading habit, and frequently, when growing in congenial positions, spreads or multiplies into two or three tufted crowns, each of which sends up a cluster of fronds. The stipes, which is excessively brittle and herbaceous, is somewhat variable in length, being in some specimens shorter than the leafy portion, in others about the same length, and occasionally much longer. At its base it is of a reddish colour, but becomes green above, when young being frequently green throughout: the rachis being also sometimes green throughout, and sometimes tinged with red. The general shape of the frond is broadly lance-shaped, or narrowly ovate, tapering to a point at its apex, like most Ferns, by the gradual diminution in the length of the pinnæ, broadest in the centre, and tapering very slightly towards its base. It is bi-pinnate, the pinnæ being set on opposite sides of the rachis, sometimes in pairs, but often in irregular alternation. The pinnæ are narrowly ovate in form, and are again divided into small ovate pinnules set on opposite sides of the mid-stems of the pinnæ in irregular alternation. The pinnules are deeply cleft into lobes, sometimes almost again divided, the lobes being fringed or serrated. The venation consists of a wavy mid-vein running through the pinnules, with two or three times forked venules running into the lobes, and bearing upon them under a somewhat irregular system of distribution, roundish clusters of spore cases furnished each with its hood-like, or inflated indusium, which is attached at one of its sides to the lobe bearing the sorus—the point of attachment being on that side of the sorus which is nearest the base of the lobe. When the plant is not highly developed, the mid-stems of the pinnæ become the centres of the system of venation, venules branching from them into the partly divided,

or cleft pinnules, upon the under surface of which are borne the sori. Often when fully ripe the fructification of this beautiful Fern—which is from its fragile and delicate nature deciduous, the frond dying on the approach of winter—becomes confluent, and nearly covers the whole under-surface of the frond. There are nearly twenty variations from the normal form of *Cystopteris fragilis*.

DISTRIBUTION.—Over a very widely extended portion of the Fern world this beautiful species is found. It is an inhabitant of Europe, Asia, Africa, and America, occurring in, amongst other places, the following:—Generally throughout Europe, and as far north as Greenland; also in the Altai and Ural Mountains, in Afghanistan, Asia Minor, the Himalayan Mountains, Kamtschatka, Nepal, Siberia, Simla, and Thibet; in Abyssinia, at the Cape of Good Hope, in the Azores, in the Canary Islands, and in Madeira; in the Bahama Group, in California, Canada, Chili, Columbia, Cuba, Guatemala, Jamaica, Mexico, New Grenada, Peru, Quito, Tasmania, and in the United States; also in the islands of the Atlantic. In England, it is found in the counties of Chester, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hereford, Kent, Lancaster, Leicester, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it is an inhabitant of the counties of Anglesea, Brecknock, Carmarthen, Cardigan, Denbigh, Flint, Glamorgan, Merioneth, Montgomery, and Radnor. In Scotland, it is found in the counties of Aberdeen, Argyle, Berwick, Caithness, Clackmannan, Dumbarton, Dumfries, Edinburgh, Elgin, Fife, Forfar, Inverness, Kincardine, Kirkeudbright, Lanark, Linlithgow, Nairn, Perth, Ross, Stirling, and Sutherland, as well as in the Isles of Orkney and Harris. In Ireland it is somewhat rare, occurring only

in the counties of Antrim, Cork, Down, Galway, Kerry, Leitrim, Sligo, and Wicklow.

CULTURE.—Given shade and abundant moisture, this beautiful little Fern becomes one of the most hardy of our native Ferns, as well as one of the most vigorous growers. In the Fern house, in the Fern case, or in pots, it will thrive admirably. If it be planted in pots, they should stand in a saucer of water ; but it must be perfectly drained, so that the water can percolate freely, and the water in the saucer must not be allowed to become stagnant. The soil should consist of peat and loam, and leaf-mould in equal proportions, with sand equal to about one-fourth of the whole ; and it is desirable and beneficial to this Fern to put several pieces of broken limestone in the soil, whether it be planted in the open rockery, indoors in pots, or in the Fern house. Being a rock-growing Fern, it is also desirable, in planting it, to place the caudex—which may be propagated by division—between pieces of stone or rock.

22.

THE ALPINE BLADDER FERN.

Cystopteris regia.

PLATE 5, FIG. 2, PAGE 225.

THE claim to rank this extremely beautiful little Fern as a distinct species has been disputed by some botanists, who have contended that it is but a variety of *Cystopteris fragilis*. Its peculiar distinctness of form, however—a distinctness which it maintains under cultivation—fairly entitle it to the position which is conceded to it by the great majority of those who have given any attention to the subject. It takes its common name of Alpine Bladder Fern from the fact that its European head-quarters are found in the Alps, where it grows in great abundance. The specific botanical name, *regia*, has no doubt been suggested by the extreme elegance of the plant. It is found growing in very much the same situations as *Fragilis*, in rocky fissures, and sometimes on old walls.

DESCRIPTION.—The general resemblance which at first sight this little Fern bears to *Fragilis*, has, doubtless, led to its being confounded with the latter. The points of distinction, however, can be easily explained. In the first place there is a difference in length of several inches, the maximum length of frond of this species not exceeding ten inches. The stipes is much shorter than in *Fragilis*, and the pinnae are broader, blunter, and, consequently, more completely egg-shaped, more crowded, and more evenly set

in pairs upon opposite sides of the rachis. The pinnæ, too, are more divided, becoming in well-developed specimens almost tri-pinnate. The general form of the frond is egg-shaped, or broadly lance-shaped, broadest in the middle, tapering to a point at the apex, and tapering very slightly towards the base, the lowest pair of pinnæ being slightly shorter than the pair next above it. The latter and the third pair are usually the longest, and from them the pinnæ gradually diminish in length to the apex of the frond. They are divided into short, bluntish pinnules, alternately placed on each side of their mid-stems, and diminishing in length towards their apices. The pinnules are deeply cleft, sometimes almost divided down to their mid-veins; the lobes into which they are cleft being what is called dentated, or toothed—bluntly so. The system of veins is extremely and elaborately beautiful. From the mid-veins of the pinnules venules branch into the lobes, and from these venules veinlets again branch—one veinlet being carried into each of the marginal teeth, into which the lobes are divided. Near the margins of these leafy teeth are borne the roundish sori scattered pretty evenly over the under-surface of the frond but not, as in *Fragilis*, becoming confluent or run together. The rootstock is small and tufted, and the fronds of a vivid green colour and herbaceous. There have been no varieties of this charming little Fern discovered—a fact which gives it a greater claim to rank as a distinct species.

DISTRIBUTION.—Both in Europe and in Asia *Cystopteris alpina* has been found—in Europe most abundantly in the Alps. It is an inhabitant of Belgium, Croatia, Dalmatia, France, Greece, Hungary, Italy, Spain, Sweden, and Transylvania. In Asia its discovered habitats are in Asia Minor. In the British Islands this Fern is extremely rare as a wild

plant. Specimens have been found in Derbyshire ; upon an old wall at Low Leyton in Essex, though it has now disappeared from that particular habitat ; at Saddleback, in the lake district of Cumberland, and in Yorkshire. It is stated to have been found in Wales on Snowdon, and at Cwm Idwell ; and in Scotland on Ben Lawers.

CULTURE.—The same kind of soil and a similar position in regard to shade and shelter will suit all three of our Bladder Ferns. Good drainage, plenty of moisture, and complete shade are the necessary requirements, with a soil consisting of equal parts of loam, peat, and leaf-mould, with sand enough to make one fourth of the entire quantity of soil. There should also be some small pieces either of broken limestone or sandstone mixed in with the compost. It can equally well be cultivated on the open rockery—in its higher parts—in pots, in a case, or in the Fern house. Its love of moisture makes it thoroughly at home amidst an atmosphere of constant moisture. In planting it, wherever it may be placed, it is desirable to fix the crown between little blocks of stone, covering the rootlets, but leaving the crown well above the surface.

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FIG. 1. SOFTLY PRICKLY SHIELD FERN

[*Polystichum angulare*]

2. HOLLY FERN

[*Polystichum lonchitis*]

X 3. HARD PRICKLY SHIELD FERN

[*Polystichum aculeatum*]



23.

THE MOUNTAIN BLADDER FERN.

Cystopteris montana.

PLATE 5, FIG. 3, PAGE 225.

AMONGST our British Bladder Ferns this is not only the rarest species ; it is, of all our native Ferns, the rarest of the rare. Its common and its botanical name both indicate that this is a Fern of mountainous regions. It loves to grow in rocky crevices and on dripping rocky ledges in mountain ravines. From the fact that it has a creeping rootstock, or rhizoma, and not a tufted caudex, like the other Bladder Ferns, it might seem more appropriate to rank it as a Polypody ; and, were the form of the rhizoma the mark by which the Polypodies are known, there would be sufficient reason, perhaps, for including it in that genus. Indeed, the generic name of Polypodium is given to it by some botanical writers. But the distinguishing mark of the Polypodies is the uncovered or non-indusiate spore clusters, and this Fern has the hoodlike cover peculiar to the genus *Cystopteris*. Hence there is a sufficient reason for ranking it as a species under that genus.

DESCRIPTION.—The general outline of the fronds, with the exception of the indentations of the lobes, singularly resembles the Three-branched Polypody. Like it, *Cystopteris montana* is very distinctly three-branched in appearance, in

consequence of the lowest pair of pinnæ being much larger and more developed than the pairs above them. Like *Dryopteris*, too, the lower pinnules—nearest the main rachis—on the lowest pair of pinnæ, are longer than the upper ones, and the point of the rachis where the lowest pair of pinnæ join it, when they are exactly opposite, is thickened into a notch or joint. Some other points of resemblance will be noticed in the following details of description. The fronds grow from their creeping rhizoma to a length of from four inches to ten, occasionally exceeding ten inches. The stipes, which is furnished with a few scales at its base, is usually twice as long as the leafy part of the frond. The shape of the latter is somewhat triangular, or more strictly four-sided, from the circumstance of the lowest pair of pinnæ being bent upwards out of a right angle. The lowest pair of pinnæ are much more divided than the higher ones, being what is called tri-pinnate, or three times divided. They are usually, but not always, set on to the rachis exactly opposite. But the succeeding pairs are sometimes arranged in irregular alternation. Commencing with the lowest pair of tri-pinnate pinnæ, it will be noticed that their lower pinnules, next the main rachis, are much longer than the upper ones, are of an oblong, egg-shaped form, tapering to a blunt point at their apices, and are divided into a series of egg-shaped secondary pinnules, which in their turn are again divided into slightly notched or toothed lobes. All the pinnules on the lower pinnæ have much the same general form, differing, however, in size. The lower pinnule standing second on each pinna is also longer than the one above it. But the proportionate difference between upper and lower pinnules becomes less and less away from the main rachis, until towards the apices of the pinnæ the opposite pinnules become equal in length, finally becoming merged. A somewhat similar difference between upper and lower pinnules is also to be noticed on

the pair of pinnæ next above the lowest; but this pair, being much smaller and less divided than the lowest pair, the difference is not so prominent. On the third and succeeding pairs of pinnæ above the base of the leafy part of the frond the upper and lower pinnules are nearly equal in length. The subdivision of the pinnæ becomes less and less upwards as they become shorter and narrower, until at length they are merged in the apex of the frond. The venation is more or less complex according to the more or less divided form of the pinnæ. In each ultimate division, whether it be a secondary pinnule or a lobe, there is a mid-vein, with venules branching into all the subdivisions, and it is noticeable that the veins terminate, not within the lobes formed by the serratures, but at the points formed by the clefts between two serratures. The sori are numerously scattered about upon the under surface of the frond, each sorus covered by the bulged or hood-like indusium. There are no variations from the normal form of *Cystopteris montana*.

DISTRIBUTION.—This elegant little Fern has a wide range throughout Europe, occurring in the following countries: Denmark, France, Germany, Hungary, Italy, Lapland, Norway, Spain, and Sweden. It has also been found in Asia and in North America. In the British Islands this is one of the rarest species. It is stated to have been found on Mount Glyder in North Wales, but there is some doubt as to the accuracy of the statement. In Scotland it was first discovered in 1836, on Ben Lawers, in Perthshire. Subsequently it has been found in the same neighbourhood at Corrach Dh' Oufillach, in the Meal Oufillach mountains, lying between Glen Lochy and Glen Dochart in Perthshire. Since then it has also been found in Canlochen, at the head of Glen Isla, Clova, in the county of Forfarshire.

CULTURE.—The same soil should be used in the cultivation of *Cystopteris montana* as that suggested for the two

other species of our native Bladder Ferns. But as this species has a creeping rhizoma, a shallow pan is the best for pot culture. The same conditions, however, as to shade and shelter should be maintained for this species as for the two last described.

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FIG. 1. BROAD BUCKLER FERN

[*Lastrea dilatata*]

2. ALPINE POLYPODY

[*Polypodium Alpestre*]



24.

THE OBLONG WOODSIA.

Woodsia ilvensis.

PLATE 6, FIG. 5, PAGE 235.

THE only British representatives of the genus *Woodsia* are two diminutive, beautiful and extremely rare little Ferns. This generic designation is not descriptive but commemorative, having been suggested in compliment to Joseph Woods, an English botanist. The peculiar nature and construction of the indusium in these Ferns give to them a very distinct character and separate them from anything like close connexion with any of the other British species. We have seen that in the case of most Ferns the indusium is merely a cover to the sorus, or heap of spore cases, whether this cover be formed by a special organ like the flat scale in the Shield Ferns and the inflated hood-like scale in the Bladder Ferns, or by a bending back of the margin of the frond. In the *Woodsias* the indusium is in the form of a concave scale, which lying *under* the clusters of spore cases is provided with a fringed margin, which spreads over them. The specific name *ilvensis* applied to the present species, refers to the island of Elba where this Fern was first discovered. *Woodsia ilvensis* is an inhabitant of mountainous districts, where it is found growing in the moist crevices of rocks at altitudes ranging from twelve hundred to two thousand feet above the sea level.

DESCRIPTION.—A small-tufted rootstock provided with

fibrous rootlets. The fronds—thrown up in clusters—have a somewhat short reddish stipes, the reddish colour being also continued a little way along the lower side of the rachides. They vary in length from one or two to four or six inches, are thick and leathery in texture, and on their upper side are of a dull green. The general form of the leafy part of the frond is oblong—hence the common name of the species. It may be described to be lance-shaped or narrowly egg-shaped, broadest in the middle, tapering towards the base and to a blunt point at the apex. It is pinnate or once divided, the lowest pinnae being usually set along the rachis in opposite pairs, but higher up in the frond, the pinnae are placed in alternation on opposite sides of the rachis. They are oblong in shape or somewhat egg-shaped—terminating in a blunt point at their apices—and are pinnatifid, or deeply cleft into lobes, the incisions reaching down almost to the mid-veins of the pinnae. The venation is somewhat indistinct, owing to the thick and almost opaque texture of the pinnules. From the mid-veins running along the pinnae, there are sometimes single and sometimes branched venules proceeding into the pinnules, and bearing the sori near the margins of the latter. Over the whole surface of the fronds, underneath as well as on the upper side, are scattered a number of scales or bristles and white shining hairs. These scales and hairs are likewise continued along on both sides of the stipes and rachis, and are so thickly scattered on the under surface of the frond as to give quite a woolly appearance to it, and to form a sort of snug covering under which the indusiate spore cases lie. When the frond has reached its maturity, the scales and hairs turn from a shining white or greenish white colour to a light brown colour. A curious arrangement of the stipes must be noticed. A little way above the crown of the rootstock, the stipes is jointed or articulated, and when the fronds decay

each year—for this Fern is a deciduous species, its fronds disappearing on the approach of winter—they drop off, not as in most Ferns at the point of junction of the stem with the crown of the rootstock, but at the point of articulation, thus leaving a little cluster of short bare stems standing up. The normal form of *Woodsia ilvensis* is subject to no variety.

DISTRIBUTION.—In Europe the range of this little Fern extends to the following countries:—Denmark, France, Germany, Hungary, Iceland, Italy, Lapland, Norway, Russia, Spain, Sweden, and Switzerland. In Asia it has been found in Kamtschatka and Siberia. It is also an inhabitant of the extreme north of North America, of Canada, and of the United States. In England it is extremely rare. It has been discovered in Cumberland; on Cauldron Snout, and Falcon Clints, Teesdale, in the county of Durham—near Cauldron Snout, growing upon some basaltic rocks; also in the lake district of Westmoreland. In Scotland the habitats of this Fern are slightly more numerous. In Dumfriesshire, one habitat is in a ravine near Loch Skene; another is at a place called the Devil's Beef-tub; others are upon the hills north of Moffatt in that county, upon a farm called Corehead about four miles from Moffatt. It is abundant on the hills which divide Dumfriesshire and the county of Peebles, the situation being upon steep and crumbling rocks. Other North Britain habitats are Glen Fiadh, amongst the Clova Mountains in Forfarshire, near Forres in Morayshire, on Ben Chonzie near Creiff, and on Ben Lawers in Perthshire. In North Wales its habitats are at Clogwyn-y-Garnedd, on some rocks in the vicinity of a small lake called the Dog's Lake, or in Welsh Llyn-y-Cwm, going up towards Glyder Vawr. A considerable number of plants are known to exist there, but they are inaccessible except to those who may come to seek them provided with a ladder. From the fact that the natural habitats of this Fern are so frequently found to be inaccessible,

it may happen that they are not so rare as is generally supposed, and that they would be discovered to be more abundant could a thorough search be made in the lofty, rocky situations which they prefer to inhabit. At the pass of Llanberis in Carnarvonshire, they are also found growing upon a kind of limestone rocks.

CULTURE.—From its small size and elegant form, this little Fern is especially adapted to cultivation in the Fern case upon miniature rockwork. But it may be grown in the open rockery, in pots, or in the Fern house. It is essential, however, that wherever planted it should have the most perfect drainage, and must be kept moist and cool in a shady nook. It should be planted between small blocks of stone, in a soil composed of light peat and light loam, in equal proportions, together with clear sand equal to about one-fourth of the whole. It will be advantageous to mix in the soil some small pieces of sandstone rock.

25.

THE ALPINE WOODSIA.

Woodsia alpina.

PLATE 6, FIG. 4, PAGE 235.

THOUGH this extremely beautiful but diminutive little Fern is reputed to be exceedingly rare, even rarer than *Woodsia ilvensis*—only a small number of habitats having been recorded—it is possible, as already suggested in the case of the Oblong Woodsia, that it may grow plentifully in inaccessible localities, or in localities which, if not absolutely inaccessible, are so difficult of access as to have hitherto precluded search. The specific name of the present species denotes the nature of the localities in which it is found, namely, high mountainous districts. In such districts it grows in the shady clefts and crevices of moist and dripping rocks.

DESCRIPTION.—If a frond of the Oblong Woodsia were photographed, and the figure reduced by the process to half the natural size of the frond, the result would give something like a general representation of *Woodsia alpina*. The little plant grows to about half the size of its relative *Ilvensis*, and may be, in some sense, regarded but as a diminutive likeness of the latter. Yet there are some peculiarities, which, in addition to its size, entitle it to take rank as a distinct species. It grows from a tufted rootstock, similar to *Ilvensis*, though smaller, throwing up its fronds in little tufts. The stipes is shorter than the leafy portion, the entire frond—

stipes, and leafy part—rarely exceeding three inches in length. The leafy outline is somewhat oblong in shape, widest in the middle, where it is rarely more than half an inch across, tapering to a blunt point at the apex, and tapering also slightly towards the base. It is pinnate, the pinnæ being bluntly egg-shaped, broadest at their bases, and pinnatifid, or deeply notched into lobes, though not cleft down to the mid-stems of the pinnæ. They are placed in somewhat irregular alternation along on opposite sides of the rachis, growing smaller towards the apex of the frond, until they are merged at the extreme point into a blunt lobe. Like *Ilvensis*, the lower part of the stipes is jointed, the fronds falling off, when they decay, at the joint, and not close to the crown of the rootstock. It is noticeable, however, that both the stipes and the upper surface of the leafy portion of the frond in *Alpina* are much smoother than in *Ilvensis*, and that the under surface is not so densely covered with scales and shining hairs. On this account the spore cases, with their fringed indusia, are more conspicuous. The character of the venation in *Alpina* is similar to that in *Ilvensis*, the mid-veins of the pinnæ sending out simple or branched venules into the lobes. The texture of the fronds is somewhat thick and leathery. No variations from their normal form have been discovered.

DISTRIBUTION.—Like most of our native Ferns this species has a tolerably wide range throughout Europe; for it is an inhabitant of Finland, France, Germany, Hungary, Lapland, Norway, Russia, Spain, Sweden, Switzerland, and Transylvania. It is also found in India, Siberia, and North America. No specimen of this plant has ever been found growing wild either in England or Ireland; and in Wales and Scotland there are only two or three places in which it has been found. These are in Wales, in the mountainous district of Snowdon, in the county of Carnarvon. In this district it has been

found growing in a chasm of rocks, bearing the name of Clogwyn-y-Garnedd, on the eastern side of Snowdon. It has also been found upon rocks of a limestone character, at Moel Sichog, in the pass of Llanberis. In Scotland it has been found in Glen Fiadh, in Glen Isla, and on the Clova Mountains, in the county of Forfar. On Ben Lawers, on Ben Chonzie, near Crieff, at Catiaghiamman, at Mael-dun-crosk, and on Craig Challiach, in Perthshire, as well as in the district between Glen Dochart and Glen Lochy.

CULTURE.—The same conditions of culture suggested for *Woodsia ilvensis* will do equally well for this very beautiful Fern.

26.

THE MALE FERN.

Lastrea filix-mas.

PLATE 3, FIG. 2, PAGE 199.

THE British Buckler Ferns, to which genus the Male Fern belongs, include the finest and most robust group of our native Ferns. They were formerly included by botanists under the genus *Aspidium*, which, as we have already seen, has been since split up into several smaller groups. They comprise those Ferns whose clusters of spore cases, borne on the under sides of the fronds, are furnished with roundish and notched, or kidney-shaped indusia, which are attached to the frond—completely covering the sporangia—by their notched, or indented side. The generic name adopted for the Buckler Fern group is not descriptive, but commemorative of M. Delastre, a French botanist. The specific botanical name of the present species is merely equivalent to the English designation of ‘Male Fern,’ a designation which has been given to the present species on account of its remarkably erect and robust habit of growth. The Male Fern, or Common Buckler Fern, is found growing in almost every kind of position in which Ferns in general delight, not only on the moist hedge-banks of shady lanes, on the undulating surfaces of sheltered woods, and by the margins of running streams, but in more open and sunny places, upon open hedge-tops, on the little knolls of open heaths and downs, and amongst clustered rocks or fragments of stone unsheltered by any

larger growths. Often—as it appears to the tourist who may look down upon it, perched shuttlecock fashion upon a jutting platform of earth and rock in some narrow ravine, through which a rushing stream of water finds its way; or, as it is seen high above his path, at the top of some steeply-sloping embankment—it presents a singularly handsome aspect, and though bold and erect yet endowed with a sturdy grace.

DESCRIPTION.—From a very stout caudex furnished with a mass of long and fibrous rootlets, the fronds of the Male Fern are thrown up in a circle, shuttlecock fashion, around its crown, which in large plants is often raised an inch or two above the surface of the soil. Sometimes when this Fern is growing upon the side of a steeply-sloping embankment, the rootstock becomes elongated in a horizontal position, throwing up its fronds almost at right angles to the direction, from base to crown, of the rootstock. The crown and stipes are densely scaly—the scales being often continued along the rachis, more particularly on the under side of the frond. The scales are often continued also along the under sides of the mid-stems of the pinnae, giving an extremely handsome look to the frond. In finely-grown plants, when the fronds are closely set around the crown, the scaly stems assume a cup-shaped appearance, the leafy parts of the fronds being thrown up in a slanting direction, and somewhat stiffly, thus losing the delicate drooping habit so characteristic of Ferns in general. The rachis is smooth behind, and channelled on its upper side. The stipes is much shorter than the leafy portion of the frond—seldom more than a sixth of the length of the latter. The colour of the leafy portion is dark green above—sometimes a shining green—but lighter and duller underneath. Its form is broadly lance-shaped, broadest throughout its centre, tapering somewhat towards the base, and rapidly to a point at its apex. The frond is partially bipinnate. The pinnae, long, tapering, and somewhat sharp pointed, are

placed alternately along on opposite sides of the rachis, sometimes in pairs. They are again divided on each side of their mid-stems into oblong blunt pinnules, which are more or less serrated. The division into pinnules is not carried down to the mid-stems of the pinnae, except in the case of the basal pinnules of the lowest pairs of pinnae. Towards the apex of each pinna, and towards the apex of the frond, the pinnules are pinnatifid, being less and less cleft until they become merged, or run together. Towards the apex of the frond, the pinnae, as they become shorter and shorter become less and less divided, until they are merely notched, ultimately becoming smooth, and blending into the extreme point of the frond. The system of veins is very distinct, consisting of a mid-vein in each pinnule, with forked venules extending to the margin along the greater part of the pinnule, the venules becoming simple just at the blunt point of the pinnule. The spore cases are borne throughout the upper half of the under surface of the frond, in short lines—one line on each side of the mid-vein of each pinnule. In form the clusters, or sori, are kidney-shaped, and they are covered by kidney-shaped, scaly covers or indusia, which when young are of a somewhat leaden hue; but, as the fructification becomes ripe, turn to a reddish-brown colour, like the spore cases clustered underneath them. There are more than seventy variations from the normal form of this handsome Fern, which often attains a height of four or five feet, though its average height is from two to three feet.

DISTRIBUTION.—The Male Fern abounds throughout every country of Europe. It has also been discovered in the northern parts of Asia, in Africa, in North America, in Mexico, in Brazil, in the Caraccas, in New Granada, and in Peru. Throughout England, Wales, Scotland, Ireland, and the lesser islands, this Fern is so plentiful that it is unnecessary

to give a list of localities. There are very few parts of the country from which a short walk will not bring the Fern hunter upon some specimens of *Lastrea filix-mas*.

CULTURE.—No Fern is more admirably adapted for culture of every kind than this species. In the Fern house, or in pots, it can be grown with the greatest success. It is thoroughly at home in the open rockery of the Fern garden, and adds a robust grace to its surroundings. It is so hardy that its fronds will withstand moderate frosts, if it be growing in a moderately sheltered position. It should be firmly planted in the soil—which should consist of rich sandy loam, peat, and leaf-mould in equal proportions—with its crown well above the surface. If undisturbed for several years it will become developed into a fine plant. Though it can bear exposure on the sunnier and drier parts of a rockery, it succeeds best and attains the finest proportions in deep shade, and under the influence of abundant moisture.

THE BROAD BUCKLER FERN.

Lastrea dilatata.

PLATE 9, FIG. 1, PAGE 301.

BESIDES being amongst the handsomest of the Buckler Ferns, and indeed amongst the handsomest of all our native Ferns, *Lastrea dilatata* is also the tallest of the Lastreas. Its specific name of *dilatata*, 'expanded,' or 'spreading,' has been given in allusion to its arching and spreading habit of growth. In damp woods and the sloping banks of shady lanes, as well as on the margins of running streams, this Fern is found. It is rarely seen growing in the open and exposed situations in which the Male Fern is frequently abundant. Small plants may sometimes be found in such positions, but the finest and the most handsome specimens, and withal the most graceful, must be sought for in the dampest and shadiest places.

DESCRIPTION.—Under the most favourable circumstances of growth, the fronds of this Fern will attain a height of as much as five or six feet, though, as commonly encountered in our shady, wooded, and moist hedge-banks, three or four feet is its length. Its rootstock is large and tufted, the crown often raised somewhat above the surface of the soil, and furnished with an abundance of fibrous rootlets. The stipes is very variable in length, sometimes being nearly as long as the leafy portion, sometimes, and indeed more usually, a third of its length, and sometimes less than that. It is furnished with very dark-coloured scales,

and is thickened at its juncture with the rootstock. Stipes and rachis are channelled along their upper side and smooth behind. The leafy portion of the frond is extremely beautiful, not only on account of its numerous divisions and indentations, but from the circumstance that the edges of the lobes of the pinnules are beautifully indented and bent back, or curled under. The fronds have a very elegant appearance when unrolling, because of their greatly divided form, and the rolled-in leafy heads have often a peculiarly dusky or dark-brown appearance owing to the dark colouring of the scales. The general outline of the frond is broadly lance-shaped or ovate, almost triangular, from the fact that it is usually broadest at the base and tapers upwards to a point at its apex. It is tri-pinnate, or three times divided at the base of the frond, and bi-pinnate higher up. The pinnæ are set on the rachis generally opposite in pairs. The lowest pair is much the broadest, the second pair is the next broadest, and succeeding pairs become narrower and narrower as they become shorter, until they are merged into an elongated point at the apex. The pinnæ are divided into pinnules, alternately placed along on opposite sides of their mid-stems, the pinnules being again divided either quite down to their mid-stems or in a pinnatifid manner into beautifully serrated lobes. The lowest pair of pinnæ on the frond are the most divided, and it is especially noticeable that the pinnules below the mid-stems on this pair are much longer than those above them. The difference in length is very prominent in the basal pinnules next the main rachis. But it becomes less and less prominent in succeeding pairs, until near the apices of the pinnæ the pinnules above and below the mid-stems are of the same length, and being much smaller and narrower are also much less divided, being ultimately only notched or serrated, and not divided into lobes. In the second pair of pinnæ next above the basal

pair the difference between upper and lower pinnules near the rachis is less marked than in the basal pinnae. The difference in the third pair, though noticeable, is less still; and in the higher pairs the difference between upper and lower pinnules disappears, the pinnules becoming, at the same time, less and less divided, until they are merged into the substance of the pinnae, and the latter into a point at the apex of the frond. The venation consists of a wavy mid-vein in the lobes of the pinnules, with venules proceeding towards the serratures in the leafy margins. The sori, unlike those in *Filix-mas*, are scattered over the whole under-surface of the frond, are small in size, and are arranged in thin lines along on each side of the mid-veins of the lobes or pinnules, according to the development of the leafy portions. There are more than sixty variations, more or less marked, from the normal form of this handsome Fern. In sheltered positions it is partly evergreen in character, the fronds being of a dark green colour, the stipes sometimes of a dark purple.

DISTRIBUTION.—*Lastrea dilatata* is an inhabitant of the following countries of Europe, namely:—Croatia, France, Germany, Italy, Lapland, Norway, Portugal, Spain, Switzerland, and Transylvania. In England it is found in the following counties:—Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Lincoln, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Salop, Somerset, Stafford, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York; also in the Isle of Man. In Wales it inhabits the counties of Anglesea, Brecknock, Cardigan, Carnarvon, Denbigh, Flint, Glamorgan, Merioneth, Pembroke, and Radnor. In Scotland it is found in the counties of Aberdeen, Argyle, Ayr, Banff, Berwick,

Caithness, Clackmannan, Dumbarton, Dumfries, Edinburgh, Elgin, Fife, Forfar, Inverness, Kincardine, Kinross, Lanark, Perth, Roxburgh, Ross, Stirling, and Sutherland; in the Isles of Arran, Cantire, Harris, Islay, Lewis, Orkney, and Uist. In Ireland it grows in the counties of Clare, Cork, Down, Dublin, Galway, and Kilkenny; in King's County, Limerick, Tipperary, Waterford, and Wicklow. It grows also in Jersey and Guernsey.

CULTURE.—On the open rockery, in the Fern house, or in pots, this species grows readily and admirably. Shade and moisture are essential, and—as in the case of all Ferns that in their wild state love the deepest shade of larger vegetable growths—the soil should largely consist of leaf-mould. One half leaf-mould, and the other half a mixture of light sandy loam and peat, will be the best compost.

THE HAY-SCENTED BUCKLER FERN.

Lastrea recurva.

PLATE 4, FIG. 2, PAGE 207.

To its extreme elegance of form this beautiful Fern, which is one of the smallest of our native Buckler Ferns, adds a peculiar attractiveness. Its fronds possess the exquisite scent of new-mown hay—an attraction which is shared by no other British species. On this account it fairly deserves the specific name of *æmula*, ‘to rival,’ given to it by most modern botanists. The name sometimes given to it of *fæniseeii*, from the Latin *fœnum*, hay, is also indicative of its aromatic peculiarity. The name *recurva*, however, is here retained as being more generally descriptive of the habit and appearance of this Fern. Its peculiar hay scent, though always to be detected in dried fronds of this species, is not always so immediately noticeable in growing fronds, whilst the peculiar recurved appearance, or curving forward of the lobes of the pinnules—a peculiarity which is confined to this species—is at once recognized. Hence the word *recurva*. It is an ever-green species, and grows in the sheltered hollows of woods, and on the moist and sloping banks of deeply-shaded hedgerows, loving especially positions where it can feed upon soft deposits of leaf-mould.

DESCRIPTION.—There is up to a certain point a remarkable resemblance between small fronds of *Lastrea dilatata* and fronds of the present species. So much so, indeed, that small

plants of *Dilatata* are often mistaken for *Recurva* by those who are not acquainted with the peculiar points of difference. In both Ferns the fronds are broadly lance-shaped, or triangular in form, broadest at the base and tapering to a point at the apex. The pinnæ are set on the rachis either in pairs or alternately on opposite sides of it. The fronds in both, too, are tri-pinnate at their bases, and bi-pinnate in their upper portion. The lowest pinnæ in both are arranged upon the same plan, being broader than the others, and having the lower pinnules on their mid-stems longer and more divided than the upper ones, the difference becoming less and less and disappearing at the apices of the pinnæ. In the same way, in both, this difference between upper and lower pinnules is less marked on the second pair of pinnules and becomes less and less upwards until upper and lower pinnules on the highest pinnæ are equal in length, the pinnæ becoming shorter and narrower and less divided until they are finally merged in the apex of the frond. In both Ferns, in fact, the form of pinnæ, pinnules, lobes, and serratures, is of a similar character, as also is the venation and the arrangement of the sori, which are ranged in lines on each side of the mid-veins of the lobes. But in *Recurva*, the clusters of spore cases are covered by kidney-shaped indusia which are fringed on their outer or unattached margin. Now let us see what are the points of difference between the two Ferns. In the first place, *Recurva* is much smaller than *Dilatata*, its length ranging from a foot to a maximum of about two feet, the leafy portion of the frond being about equal in length to the stipes, though sometimes shorter. There is, further, the beautiful hay scent about its fronds, and most striking feature of all, the lobes of the pinnules, instead of being bent and curled *under*, as are the lobes of *Dilatata*, are slightly bent the other way, so that their upper side is somewhat concave, instead of convex. This gives a peculiar and very elegant crumpled appearance

to the entire frond, the colour of which is a more vivid, and consequently a brighter green, than that of *Dilatata*, having in fact a sort of light blue tinge upon it. If a simple test, however, be required as to the identity of the plant, a portion of the frond can be bruised in the hand, and its fragrance or otherwise will quickly reveal its identity. The caudex is thick and tufted, with abundant fibrous rootlets and the stipides are tough and enduring. There are three or four variations from the normal form of this beautiful species.

DISTRIBUTION.—The named localities abroad in which *Iastrea recurva* grows are not numerous. Amongst them are the islands of the Atlantic Ocean, the Azores, the Cape de Verd Islands, and the island of Madeira. In England it is not a very widely distributed Fern; but it is found in the following counties:—Cornwall, Devon, Hereford, Lancaster, Northumberland, Salop, Somerset, Sussex, and York; also in the Isle of Man. In Wales it occurs in the counties of Anglesea, Carnarvon, Glamorgan, Merioneth, and Pembroke. It is found in the island of Guernsey. In Scotland it is an inhabitant of the counties of Argyle, Dumbarton, Forfar, and Inverness. In the Scottish islands it occurs in Arran, Mull, Orkney, and North Uist. In Ireland its habitats are in the counties of Antrim, Clare, Cork, Donegal, Galway, Kerry, Londonderry, Mayo, Sligo, Waterford, and Wicklow.

CULTURE.—Under cultivation this is a most beautiful and interesting Fern. Being evergreen, it possesses an additional value. It can easily be grown either in the open Fern garden, in the case—to which its moderate size adapts it—in the Fern house, or in pots. It must be kept under the influence of shade and moisture. Some of the finest specimens we have ever seen were growing in the leaf soil on the sloping side of a shady wood. In the leaf-mould gathered upon the deeply-shaded side of a hedge-bank we have also seen this extremely beautiful Fern growing in a state of great per-

fection. Under cultivation, therefore, if Nature is to be imitated, the soil in which it is planted should consist of at least one half leaf-mould. The other half should be sandy loam and peat in equal proportions. It should be planted so that its crown is well above the surface of the soil.

29.

THE RIGID BUCKLER FERN.

Lastrea rigida.

PLATE 10, FIG. 1, PAGE 325.

AMONGST the most rare of the British Buckler Ferns, *Lastrea rigida* is also the only rock-growing species of the genus in Britain. It derives its name of *rigida* from its rigid and erect habit of growth. It has a great preference for limestone rocks, in the moist crevices of which it is mostly found growing at elevations above the sea level of from twelve hundred to sixteen hundred feet. Though found in only a few localities, it is very abundant in some places, its fronds being cropped by sheep, which appear to appreciate and to relish their flavour.

DESCRIPTION.—The rootstock of *Lastrea rigida* is comparatively thick, and it has an abundance of fibrous rootlets. The stipes, which is usually about half the length of the entire frond, being about equal in length to the leafy portion, is densely scaly at its base, the scales being of a reddish-brown colour. The entire length of the frond—leafy portion and stipes—is from one to two feet, its colour being a somewhat dull green. It is bi-pinnate, lance-shaped, or ovate, and sometimes triangular in shape, with triangular pinnae set on the rachis, which is mostly scaly throughout, in pairs either evenly or irregularly on each side of it. The pinnae are divided into oblong pinnules, which, though not stalked, are attached by a narrow point of their base to the mid-

stems of the pinnæ. The pinnules are often almost pinnatifid, or deeply divided into lobes, which are not so much serrated as bluntly toothed. The system of veins is similar to that in most of the *Lastreas*, and consists of a sinuous mid-vein through the pinnules, with forked venules bearing the roundish sori, covered by their kidney-shaped indusia, and borne in short lines along on each side of the mid-veins of the pinnules. When bruised in the hand, the fronds of this Fern emit a slightly fragrant scent. There are no varieties which are permanent in their character.

DISTRIBUTION.—On the continent of Europe the Rigid Buckler Fern is found in Croatia, Dalmatia, France, Germany, Hungary, the Morea and Switzerland; also in the island of Sardinia. It is an inhabitant of Asiā Minor and Siberia, and also of parts of the United States of America. In England its range is very limited and very local. It has been found in Cornwall; in Lancashire, near Silverdale; at Arnside Knot, Hutton Roof Crag, and Farlton Knot, in Westmoreland; at Ingleborough, Wharncote, White Scars, above Ingleton, and on the Attermine Rocks, near Settle, in Yorkshire; and also, it is stated, in Somersetshire. It has never been found in Scotland or Wales, and in Ireland only in one county—Louth.

CULTURE.—Grown in sandy-loam and peat mixed in equal proportions, this Fern succeeds admirably either on the open rockery or in pots. But it must be kept very moist and cool; and as in a state of nature it is fond of limestone, it is desirable to mix little pieces of limestone in the soil, and to water with lime-water.

INDEX TO PLATE 10.



FIG. 1. RIGID BUCKLER FERN

[*Lastrea rigida*]

2. CRESTED BUCKLER FERN

[*Lastrea cristata*]



30.

THE CRESTED BUCKLER FERN.

Lastrea cristata.

PLATE 10, FIG. 2, PAGE 325.

THE Crested Buckler Fern is an inhabitant of bogs and the marshy hollows of damp woods, and, as a wild plant, is extremely rare in the British Islands. Though fond of boggy situations, *Lastrea cristata*, like almost all Ferns, prefers to grow on little knolls or elevations above the bog levels. In boggy localities there is often more or less of unevenness in the ground. Sometimes little knolls are formed by the accretion of decayed vegetable substances. Successive growths of grass or moss, or other wild plants will, as they decay, gradually raise the level of the mass formed by their roots and leafy parts. Occasionally the process is aided by tree stumps, around which moss, for instance, will densely grow, its development being greatly helped by the atmosphere saturated with moisture which continually surrounds it—an atmosphere produced by the reeking substance of the marsh or bog. It is upon such elevations as these that the Crested Buckler Fern grows. The term *cristata*, which is simply the rendering of the specific common name of this Fern, refers to the fringed or indented margins of the frond. There are many Ferns which could equally, or some perhaps with more reason, claim this designation. But the object of botanists—an object which, it must be confessed, is not always effected by botanical names,—is to give to Ferns such

designations as will represent their most prominent peculiarities.

DESCRIPTION.—The fronds of this Fern grow from the rootstock in tufts, attaining a height of from one to three feet, and assuming a very erect position. The rootstock itself has a creeping habit, so much so that it becomes branched or multiplied in time into several tufts or clusters of crowns, often extending, when the plant is growing under congenial circumstances, into patches of considerable extent, all connected with each other. The stipes is usually somewhat short, and rarely exceeds a third of the length of the entire frond, being often much shorter. It is furnished with a few scales at its base, and scales are, more sparingly, scattered over the rest of its surface. The form of the leafy portion of the frond is somewhat narrowly oblong, the pinnae being mostly of equal length from the base to about three-fourths of its length; from that point, however, narrowing to a point at the apex. They are somewhat distant from each other towards the base of the frond, but become more closely set towards the apex. The pinnae are triangular in shape, broadest at their bases, and pointed at their apices. The basal pinnae are wider than the higher ones, which gradually become narrower as they approach the apex of the frond, finally merging at the extreme point of the latter. The pinnae are divided into oblong blunt-pointed pinnules, attached by the whole width of their bases to the mid-stems of the pinnae, and somewhat sharply notched or serrated. The basal pinnules nearest the main rachis on the under side of the lowest pairs of pinnae are somewhat longer than those on the upper side. But the difference decreases as the pinnules become smaller and smaller towards the apices of the pinnae. The venation consists of a waved mid-vein running through the pinnules; and of venules branching from this mid-vein on each side, and two or three times forked, towards the serra-

tures of the pinnules. The sori are borne in lines along on each side of the mid-veins of the pinnules. They extend over the whole under surface of the frond, and are covered by kidney-shaped indusia attached by their notched or indented sides.

DISTRIBUTION.—In Europe this Fern has a tolerably wide distribution. It occurs in Belgium, Bœotia, and Croatia, France, Germany, Holland, Hungary, Russia, Scandinavia, Switzerland, and Transylvania. It is found in Siberia, as well as in Canada and the United States of America. In the British Islands its range is extremely limited. It has been found in only six counties. In Cheshire it has been obtained from the Wybunbury Bog. In Norfolk it has been obtained in the following places, namely:—At Edgefield, near Holt; at Bawsey Heath, near Lynn; at Surlingham Broad, near Norwich; and at Fritton, near Yarmouth. In Nottinghamshire it is found in Oxtun Bogs; in Staffordshire it has been found near Madeley, and in a bog near Newcastle-under-Lyne. In Suffolk it has been discovered at Westleton, and at Bexley Decoy, near Ipswich. In Yorkshire it has been found on the Plumpton rocks, near Knaresborough, and also near Malton.

CULTURE.—No difficulty whatever attends the cultivation of *Lastrea cristata* so long as it is kept in an exceedingly damp situation. It will grow readily in the open rockery, in pots, or in the Fern house. It is scarcely possible to give it too much water, and the saucer in which the pot stands, whether it be grown in the open pot or in the Fern house, should be kept filled with clean fresh water. The soil selected must be essentially of a peaty nature—one half peat, and the other half leaf-mould, with just a little sand in the compost. When grown in the rockery, the lowest tiers must always be selected, and the deepest shade, without the smallest gleam of sunshine, is essential.

INDEX TO PLATE 11.

\ FIG. 1. PRICKLY-TOOTHED BUCKLER FERN

[*Lastrea spinulosa*]

2. MOUNTAIN BUCKLER FERN

[*Lastrea montana*]

\ 3. MARSH BUCKLER FERN

[*Lastrea thelypteris*]



31.

THE PRICKLY-TOOTHED BUCKLER FERN.

Lastrea spinulosa.

PLATE 11, FIG. 1, PAGE 331.

THERE is so much resemblance between this species and *Lastrea cristata* that the claim made to rank them as distinct species has been disputed, several botanists considering the one merely as a variety of the other. Curiously enough in spite of the great rarity or rather of the extremely narrow range of *Cristata* as compared with *Spinulosa* the former has usually been considered—by those who regard the one as a variety of the other—as the normal, and the latter as the variety. The relative position, however, if this view of their relationship be accepted, should certainly be reversed, *Spinulosa* being regarded as the normal form from the fact of its being much more abundant, and *Cristata* as the variety—for the instances which give rise to a rule should always be greater in number than the exceptions. Here, however, the two Ferns are regarded as distinct species, and the description of the present species will consist chiefly of an indication of the points of difference between them. Both are found in precisely similar situations, namely, in the damp and marshy hollows of woods, and in bogs and boggy heaths.

DESCRIPTION.—The rootstock of this Fern multiplies by extending into branches with numerous crowns, as in *Cristata*, and the fronds are of the same length, namely, from one to three feet. The pinnae also are set on the rachis, in very much

the same order as in *Cristata*. Instead of being oblong, however, in general shape, the frond is somewhat triangular, being broadest at the base. The pinnæ are triangular and broadest at their bases. But the lowest ones in the frond have those pinnules nearest the main rachis distinctly stalked, which is not the case in *Cristata*. The same pinnæ, also, have their basal pinnules on the under side much longer than those on the upper side, and both upper and lower pinnules are more deeply cleft—being nearly divided down to their mid veins—than in *Cristata*. The lobes into which they are cleft, and also the pinnules generally throughout the frond, whether deeply or slightly cleft, are indented with sharp serratures fringed with sharp-pointed spines, whose points are turned towards the apices of the pinnules. Hence the specific name of *spinulosa*. The veining and arrangement of the sori on the under surface of the frond are similar to *Cristata*. But in *Spinulosa* the stipes is much longer than in *Cristata*, being generally half the length of the entire frond. The stipes is furnished at its base and throughout with a few light-brown scales, and it is particularly to be noticed that when rolled up in a little nest of balls before expanding, the heads of the rolled-up fronds have a green and naked appearance in this species.

DISTRIBUTION.—This Fern is found very generally throughout Europe, as well as in North America. In England it inhabits the following counties:—Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Worcester, and York. In Wales it is found in Brecknock, Carmarthen, Carnarvon, and Glamorgan. In Scotland it inhabits the counties of Argyle, Dumbarton, Dum-

fries, Edinburgh, Forfar, Perth, and Ross, and the isles of Harris, Lewis, and Uist. In Ireland it is somewhat local, occurring in the counties of Galway, Kerry, and Wicklow.

CULTURE.—Precisely the same conditions of culture as those suggested for *Lastrea cristata* will suit *Spinulosa*, and this beautiful Fern will thrive admirably if kept in constant shade and given an abundance of water.

THE MOUNTAIN BUCKLER FERN.

Lastrea montana.

PLATE 11, FIG. 2, PAGE 331.

As the moist hedge-bank, whose sides are clothed with the fronds of *Lastrea recurva*, gives forth the sweet scent of hay, so the open heath on the mountain side becomes fragrant by the presence of the Mountain Buckler Fern. To an exceeding gracefulness of form and delicacy of colouring, this beautiful species, like its charming relative, adds the additional attraction possessed by its balsamic odours. Opinions differ as to its title to be included amongst the Buckler Ferns, and from the circumstance that its round clusters of spore cases are partially non-indusiate, sometimes being quite naked or unprotected by the scale-like covering present in most Ferns, it has been regarded by some botanists as a Polypody, the distinguishing character of that genus consisting, it will be remembered, in the entire absence of an indusium. It is obvious, however, that in deciding as to the grouping of plants into genera, some account must be taken of general features of resemblance; and the Mountain Buckler Fern possesses so marked a general resemblance to *Lastrea filix mas*, that if it be admitted that that species has superior claims to a place amongst the Buckler Ferns, the title of the present species to a similar position cannot be gainsayed. The indusium, though not very distinctly buckler-shaped, and though often imperfect, is still present in

most instances, and covers the centre of the cluster of spore cases. The habitats of this Fern are on open, mountainous heaths, on the margins of moorland streams, in the damp recesses of woods, sometimes clothing the sides of deep ravines, and where it is present in great numbers and in great luxuriance, it fills the air with its fragrant balsamic odours.

DESCRIPTION.—Though having at first sight a striking resemblance to the Male Fern, *Lastrea montana* possesses some peculiar features, which when carefully noted will enable the difference between the two Ferns to be clearly recognized. The most striking resemblance is in the form and arrangement of pinnules on the pinnæ. The arrangement of the latter on the frond, as well as the other characters peculiar to *Montana*, will prevent any confusion of the two species. *Montana* is a deciduous Fern, its delicately-coloured fronds—which spring, like the Male Fern, shuttlecock fashion, from the crown of a tufted rootstock—dying down at the approach of each winter, and reappearing in May. The caudex, or rootstock, is short, and provided with an abundance of fibrous rootlets. The fronds vary in length according to the situation of the plant, from one or two feet to four feet, or four feet and a half. Though their general outline may be said to be lance-shaped, they possess this peculiarity that they not only taper at both ends, but they taper even more acutely towards the base than towards the apex. It is this character that at once renders *Montana* distinct from *Filix-mas*. Though the latter tapers slightly towards the base, there is not a very great difference in width between the widest central pinnæ and the basal ones. In *Montana* the widest part of the frond is near the apex, and from that part to the apex the tapering is rapid. In the other direction, however, towards the base of the frond, the pinnæ taper very gradually until they often become nothing

but tiny leafy expansions of less than a quarter of an inch in width. As a consequence the stipes is very short. It is furnished with a few golden-coloured scales. Its colour, as well as that of the rachis, is yellowish, or golden. The pinnae towards the base are distinct from each other, and triangular in shape, pointed at their apices, the short ones bluntly triangular, the long ones narrowly so. They are pinnatifid, or deeply cleft, on each side of their mid-stems, into oblong obtuse-pointed pinnules, which are never, however, quite divided down to the mid-stems of the pinnae, but connected by a leafy wing, into which the pinnules run. It is in this, the form and arrangement of the pinnae, that they so nearly resemble the Male Fern. The system of veins consists of wavy mid-veins running through the pinnules, and giving out alternately from each side simple or forked venules, which bear upon their extremities the small roundish clusters of spore cases. The fructification is more abundant on the upper side of the frond, the spore cases being arranged in lines along the two margins of each pinnule. They are covered, as we have seen, by an imperfect indusium, which usually consists of a small scale over the centre of each sorus, or heap of spore cases. The rich golden-green colour of the fronds of *Montana* are another feature which renders it distinct from most forms of *Filix-mas*; and on the under surface are scattered a number of glandular bodies, which emit the fragrant scent of the fronds. The young fronds, too, when unrolling from the crown, instead of being like those of *Filix-mas*, rust-coloured, have the appearance of white silvery balls, and are most beautiful. There are about eight or nine variations from the normal form of this species.

DISTRIBUTION.—Ranging from the sea level to an altitude of three thousand feet above it, this Fern is found throughout Europe, to which quarter of the globe it is believed to be

almost confined—occurring in Belgium, Croatia, France, Germany, Greece, Hungary, Italy, Norway, Russia, Spain, Switzerland, and Transylvania. In England it is found in the following counties:—Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Lincoln, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it is an inhabitant of the counties of Anglesea, Brecknock, Carmarthen, Carnarvon, Cardigan, Denbigh, Flint, Glamorgan, Merioneth, and Radnor. In Scotland it is very abundant in certain localities—often clothing the mountain side. It is found in the counties of Aberdeen, Argyle, Berwick, Clackmannan, Dumbarton, Dumfries, Edinburgh, Elgin, Forfar, Kinross, Lanark, Perth, Roxburgh, Stirling, and Sutherland. It is found also in the Isles of Arran, Cantire, Islay, Shetland, and Uist. In Ireland it is an inhabitant of Clare, Donegal, Galway, Kerry, Londonderry, Waterford, and Wicklow.

CULTURE.—Under cultivation the Mountain Buckler Fern should have a great abundance of water, and a soil of three-fourths peat, and one-fourth of sandy loam and leaf-mould in equal proportions. The lower tiers of the Fern rockery will suit it best, and the most perfect shade.

33.

THE MARSH BUCKLER FERN.

Lastrea thelypteris.

PLATE 11, FIG. 3, PAGE 331.

THE most delicately herbaceous and fragile of the British Buckler Ferns, *Lastrea thelypteris* is also the only one amongst our native species which loves to grow absolutely *in* water. Its common name sufficiently represents this peculiar character and habit of the plant. Its botanical specific name of *thelypteris* is a compound word signifying Lady Fern, and the species is sometimes called the Female Buckler Fern, probably on account of its extreme delicacy of form and texture. Some botanists have ranked this species amongst the Polypodies, and its truly creeping rhizoma certainly gives some reason for its inclusion amongst the 'many-footed' Ferns. In this character of its rootstock, indeed, it is essentially different from all the other English *Lastreas*. But the indusium, though small, thin, and of no particular shape, is nevertheless present, and thus provides a different arrangement from that of the Polypodies. The Marsh Buckler Fern is an inhabitant of marshes and wet bogs, its rhizomas and rootlets being often entirely immersed in water. Over the thick black ooze of a bog these rhizomas travel, spreading into quite a network of clustered crowns, and sending up here and there waving tufts of their delicate fronds, which often offer a beautiful contrast to the black bog-water.

DESCRIPTION.—The fronds of this Fern—which grow from creeping, blackish rhizomas, furnished with an abundance of long fibrous roots—are of two kinds, barren and fertile, the former being the longest and reaching a length sometimes of four feet; whilst the barren fronds are of lengths varying from a foot to three feet or more. Let us take the barren frond first. The stem—thin, very slender and brittle—is about equal to the leafy part of the frond. It and the rachis are pale-green in colour. The form of the leafy portion is lance-shaped, broadest in the centre, tapering to a point at the apex, and tapering somewhat also towards the base. The pinnae are somewhat distant, irregularly lance-shaped, pointed at their apices and pinnatifid, or deeply cleft into short, oblong blunt-pointed or rounded pinnules, connected at their bases by a narrow leafy wing running along on both sides of the mid-stems of the pinnae. So thin is the texture of this Fern, that the venation can be distinctly seen on holding a frond against the light. The mid-veins of the pinnules are wavy, and are again divided into alternate branched venules. In the fertile fronds the pinnules are somewhat more contracted or bent under, and the venules bear upon them the almost circular clusters of seed-cases, furnished with thin, small, and circular indusia, midway between the mid-veins and the margins of the pinnules. The indusia are, however, soon thrown off by the development of the spore cases, and disappear. The seed-clusters then usually become confluent, or run together, and are partially protected by the margins of the pinnules, which are bent back and over them.

DISTRIBUTION.—Like the majority of our British Ferns, the present species is very generally distributed over the continent of Europe. It is also an inhabitant of the islands of the Atlantic Ocean, of the north-western part of Asia, of

Algiers, of the Cape of Good Hope, of North and of South America, and of New Zealand. In England it is found—often covering large areas—in the counties of Bedford, Berks, Cambridge, Chester, Cumberland, Devon, Essex, Hants (including the Isle of Wight), Hereford, Huntingdon, Kent, Norfolk, Northumberland, Nottingham, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, and York. In Wales its habitats are in the counties of Anglesea, Glamorgan, and Pembroke. In Scotland it is very rare, only one county—Forfar—being named as its habitat. In Ireland it is an inhabitant of the counties of Antrim, Galway, Kerry, and Mayo.

CULTURE.—In the culture of this semi-aquatic and beautiful Fern, the closest possible imitation of Nature should be attempted. Some of the finest wild specimens we have seen we found growing in a bog, hid beneath the shelter of clustering trees at the foot of a sloping hill. The spot would have been a dangerous one for the unwary tourist, and we had to wend our way carefully from tiny islet to tiny islet formed by mossy tree-stumps. But we had a sure and trusty guide, and we made no false steps, or we might have slipped into the black and liquid depths of this wood-covered morass. In its most liquid parts, we came upon an abundance of the Marsh Fern, their rhizomas appearing to float on the surface of the bog, their beautiful light-green waving fronds contrasting with its dark substance. In such a position it is clear that the annual crops of leaves dropping from the sheltering wood must have added a rich store of leaf-mould to the peaty substance of the bog, thus stimulating the growth of the Ferns. Under cultivation, the soil must be of a semi-liquid kind, composed of two parts peat and one part of leaf-mould. If a sufficiently wet situation cannot be found at the foot of a fountain, or elsewhere, a situation should be extemporized by cementing

a substratum of stone, and placing upon this the necessary bed of peat and leaf-mould; so that the water may be retained, and the rhizomas of the Fern kept immersed in the boggy soil, with their crowns just above the surface. In pot-culture, a flat pot, or pan, should be selected for *Lastrea thelypteris*, and similar conditions of growth extemporized.

THE FORKED SPLEENWORT.

Asplenium septentrionale.

PLATE 6, FIG. 14, PAGE 235.

Our native Spleenworts form an extremely beautiful and interesting group of evergreen Ferns. They are essentially rock-loving species, and are mostly small in size. The common name of Spleenwort, which is a rendering of the botanical generic name of *Asplenium*, derived from the Greek *asplenon*, has been given to this group of Ferns on account of a belief—largely held by ancient herbalists, and shared by our old botanical writers—that the Ferns forming the group possess the power of curing diseases of the spleen. Botanically considered the genus *Asplenium*—which includes ten species which are inhabitants of the British Islands—consists of Ferns whose spore cases, borne on the backs of the fronds in elongated clusters, are covered by indusia of the same shape as the clusters and attached to the frond by that side which is towards the margins of the pinnules or pinnae—whichever it may be—bearing them. Of the reason for the choice of the specific name—*septentrionale*, ‘northern,’—of the present species there appears to be no better explanation than that the Fern is chiefly an inhabitant of the northern parts of Britain. It grows in the moist crevices of rocks and walls, often being hid away underneath projecting stony spurs or completely enveloped—rootstock and fronds—

within rocky fissures. It is one of the rarest of our native Ferns.

DESCRIPTION.—It would not be an inapt description to liken this little Fern at first sight to a tuft of grass, so narrow and thin are its fronds, which grow in pale green-coloured tufts from a little rootstock furnished with an abundance of very fine fibrous and wiry rootlets. The stipes is much longer—often two or three times longer—than the leafy portion of the frond, if that may be so called which is little more than a narrow leafy blade, or widening out, as it almost seems, of the upper part of the stipes, or of the two or three branches into which the frond is divided. But whether simple or twice or thrice branched, the leafy expansion seldom exceeds the eighth of an inch in width. Each branch is generally cleft or notched into sharp-pointed segments, and the veining depends upon the simple or branched state of the frond, there being either a simple vein which is in some sort a continuation of the stipes or a branched vein with a forked venule proceeding through the leafy portion of the frond, and entering either its simple apex or the divisions into which its apex is cleft. On the under side of these blade-like ultimate divisions of the frond, the sori or clusters of spore cases are produced in lines along in the direction of the vein or veins and attached to them. The scale-like indusia are attached to the frond by the marginal edges of each division—the free or unattached sides of the indusia being towards the mid-veins. As the seed clusters develop they throw back the indusia, become confluent, and densely cover the whole of the under surface of the tiny frond. When the inside margins of the indusia are first pushed upwards, and before they are completely thrown back, the back of the frond has the appearance of a kind of longitudinal groove or receptacle, opening from the centre and exposing its enclosed mass of dark-brown

fructification. The entire length of the fronds of this Fern does not exceed six inches, and they are frequently only two or three inches in length.

DISTRIBUTION.—On the continent of Europe *Asplenium septentrionale* is found in Belgium, Denmark, France, Germany, Hungary, Italy, Lapland, Portugal, Russia, Scandinavia, Spain, Sweden, and Switzerland. In Asia it is found in the northern parts of India, and it is also an inhabitant of Mexico. In England its recorded habitats are as follows:—In Cumberland, at Borrowdale, at Helvellyn, on Honister Crag, at Keswick, at Patterdale, on Scawfell, in the Vale of Newlands, and in a ravine near Wastwater; in Northumberland on the Kyloe Crag; in Somerset near the little hamlet of Culbone, in the neighbourhood of Oare Church, and on a wall bordering Exmoor about four miles from Porlock; in Westmoreland at Ambleside; and in Yorkshire at Inglebrough. In Wales habitats have been discovered at the following places:—In Carnarvonshire, at Bettwys-y-Coed, at Capel Curig, at Carnedd Llewellyn, at Craig Ddu, by the pass of Llanberis, at Llyn-y-Cwm, at Moel Llechog, and at Pont-y-Pair; in Denbighshire, at Llan Dethyla, near Llanrwst. In Scotland it has been found at the pass of Ballater in Aberdeenshire; at Arthur's Seat, Blackford Hill, and in some other localities in the vicinity of Edinburgh; on the Stenton Rocks, in the neighbourhood of Dunkeld, in Perthshire; and on the Minto Crag, and at Jedburgh, in Roxburghshire. No habitats of this Fern are recorded in Ireland.

CULTURE.—In planting this Fern either upon a rockery or in pots, the soil should consist of sandy peat and leaf-mould in equal proportions, and the Fern should be placed between little fragments of stone with its crown well secured, and above the surface of the soil, or in stony clefts either in the rockery, the Fern case, or the Fern house.

THE ALTERNATE SPLEENWORT.

Asplenium germanicum.

PLATE 6, FIG. 16, PAGE 235.

THE arrangement of the pinnæ of the fronds of this little Fern suggests its specific common name. It is an extremely rare species in Britain, having been found only in two or three localities. It is indeed rarer, as a wild plant, than *Septentrionale*, and grows in similar positions, sometimes being found in its company. Essentially a rock-loving Fern, it is fond of positions in moist rocky clefts, generally at altitudes ranging from about three hundred to one thousand feet above the sea level. It has, from a sort of general resemblance to some specimens of the Wall Rue—*Asplenium ruta-muraria*—been considered by some botanists to be merely a variety of that species. It is, however, sufficiently distinct from it to deserve to rank as an individual species. The name *germanicum*, in reference to its being an inhabitant of Germany, has no particular significance—except that it is very much prized in that country—and must merely be regarded as a somewhat accidental distinguishing appellation.

DESCRIPTION.—From a small tufted rootstock provided with numerous fibrous wiry rootlets, the fronds of this little Fern—growing to a maximum height of six inches, and often much less than that in length—are thrown up in clusters. The stipes, pale green in colour, is about the same length as the leafy portion of the frond. On each side of

the rachis are arranged, alternately, stalked wedge-shaped pinnae, which, like the stipes and rachis, are pale green in colour, seldom more than the eighth of an inch broad, and attached to the short stem which connects them with the rachis by their narrow wedge-shaped points. These pinnae are more or less deeply cleft or notched at the apices on their upper and broader ends. A vein enters each pinnae at its base—in continuation of the connecting stem from the point of attachment to the rachis—and is then twice or thrice branched into venules, which run towards the apical divisions of the pinnae, and bear upon them elongated clusters of spore cases, which are entirely covered when young by elongated and somewhat inflated indusia. As the spore cases develop and ripen, the covering cuticle or indusium is burst and thrown back, the brown spore cases are shown and soon become confluent, covering the entire under surface of the pinnae. There is only one recorded variety from the normal form of this species.

DISTRIBUTION.—The countries on the continent of Europe in which this Fern is found are Belgium, Croatia, Dalmatia, France, Germany, Hungary, Italy, Norway, Spain, Sweden, and Switzerland. In England its named habitats are in the neighbourhood of Borrowdale and Helvellyn, in Cumberland, on the Kyloe Rocks in Northumberland, and near Culbone in Somerset. In Wales at Moel Lechog, a steep rock at the pass of Llanberis, and between Capel Curig and Llanrwst. In Scotland it was gathered in 1857, within two miles of Edinburgh. It has also been found in Fifeshire near Dunfermline, on the Stenton Rocks near Dunkeld in Perthshire, on the Minto Crags near Hassendean, Roxburghshire, and in the same county on rocks some two miles from Kelso on the River Tweed.

CULTURE.—It is necessary in cultivating this Fern to be careful that it is not over-watered, that it is well drained,

and that no water is allowed to become stagnant about its roots. The same soil as that suggested for *Septentrionale* and the same manner of planting will be the best for this species. Under glass it will succeed if care be taken that the atmosphere is not kept in a very damp state around it. The ventilating hole through the knob of a bell glass will be found to secure a sufficiency of ventilation, provided the plant be periodically allowed to have air by the taking off of the glass covering for a little while.

THE RUE-LEAVED SPLEENWORT.

Asplenium ruta-muraria.

PLATE 6, FIGS. 9 AND 10, PAGE 235.

A VERY diminutive little Fern is *Ruta-muraria*, so small sometimes, even when growing, as it so often does, in the most frequented places, as to escape the attention of those who are not observant lovers of Nature. Yet, nevertheless, it is an extremely interesting little plant. Its specific botanical name means simply Wall Rue, and refers to the likeness which it bears to the common Rue, and to its habit of growing upon old walls. In reality, it is a Rock Fern, like all the Spleenworts, but it has a singular fondness for old ruins and old walls, a fondness which is due to its liking for old mortar. Hence it may often be found growing not only upon house and garden walls, but upon church-walls, upon bridge-arches, and, indeed, upon all kinds of masonry; being found, however, most abundant and most luxuriant upon old stony structures. This partiality for old walls and old ruins arises from a cause which will be easily understood. Decay in any stony structure is always accompanied by a loosening of the parts. Into the fissures created by this loosening process, particles of vegetable mould accumulate, brought thither either by the decay of leaves which may have fallen directly into them, or by the movement of the atmosphere, which carries with it light and small particles of vegetable and other matter, and deposits them, amongst other places.

in rocky crevices ; and the crumbling mortar and vegetable soil intermixed with it favour the growth of the Wall Rue, which is always found in greatest luxuriance on the loose *tops* of walls, where there has been necessarily the greatest accumulations of vegetable deposits. Sometimes loose walls and other loose stony structures are thickly covered with specimens of the Wall Rue, the little plants generally growing in an almost horizontal position, and seeking the protection for their crowns of some little jutting fragment of stone, their wiry rootlets being inserted into the moist seams between the stony masses.

DESCRIPTION.—Though a small plant, *Asplenium rutamuraria* has a somewhat thick, tufted, rootstock furnished with densely-crowded fibrous rootlets, occasionally so pressed and crowded together as to form quite a compact and almost solid mass. From this rootstock it throws up usually a considerable number of little fronds, mostly an inch or two long ; but occasionally, when growing under very congenial circumstances, reaching a length of five or six inches. In the smaller specimens, the stipes is usually about the same length as the leafy part of the frond, but in more luxuriant specimens the stipes is frequently double the length of the leafy part. The stipes is very slender and dark-green throughout, except at its extreme base, where it is somewhat blackish in colour. The upper part of the frond, like the stipes, is dark-green in colour, thick and leathery in texture, and shining. Its leafy portion is somewhat triangular in shape and twice pinnate, sometimes in luxuriant specimens nearly three times pinnate in the lower part of the frond. The pinnae are placed alternately along and on opposite sides of the rachis. The lower pinnae are divided into two or three—generally three—stalked pinnules, which are of various forms, sometimes egg-shaped or pear-shaped, and then attached by their narrower ends, to the

stalks which support them; sometimes fan-shaped and similarly attached by their narrow ends, and not unfrequently diamond-shaped. Occasionally the pinnules are again deeply cleft, or divided, thus giving a tripinnate appearance to the frond. The length and number of divisions of the pinnae decrease towards the apex of the frond, until they are reduced to single club-shaped lobes, which are slightly and irregularly toothed or serrated—the extreme point of the frond consisting of a single pear-shaped, diamond-shaped, or roundish lobe. The venation is somewhat indistinct, owing to the almost opaque character of the leafy substance of the frond. A number of veins, however, enter the lobes from their bases, and proceed thence towards the upper and wider ends, becoming branched as they proceed, a branch or venule ordinarily passing into each of the marginal serratures. The sori are borne in lines along this system of veins, covered when young by their longitudinal indusia, but becoming free when the development of the fructification has made some progress and burst its envelopes, and finally merging, or becoming confluent, and then densely covering the under surface of the little pinnules. When the fructification is quite perfect, the little plant presents a curious and interesting appearance—the upper sides of its fronds a dark shining green, their under side dark rich brown from the dense aggregation of uncovered seed cases. The fronds are very hardy and persistently evergreen, withstanding the frosts of winter, and endure until the fronds of the succeeding spring have been produced. There are upwards of fifteen variations from the normal form of this species.

DISTRIBUTION.—On the continent of Europe the Rue-leaved Spleenwort has a very wide distribution, ranging through Belgium, Bohemia, Corsica, the Crimea, Croatia, Dalmatia, France, Germany, Greece, Holland, Hungary,

Italy, Norway, Portugal, Russia, Scandinavia, Sicily, Spain, Switzerland, Transylvania, and Turkey. It is also an inhabitant of parts of Africa—both north and south—of Asia and of North America. In England it is found in the counties of Bedford, Berks, Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it is found in Anglesea and Priestholme Island, in Brecknock, Carmarthen, Carnarvon, Denbigh, Glamorgan, Merioneth, and Pembroke. It is an inhabitant of Jersey. In Scotland the counties where it is found are those of Aberdeen, Argyle, Banff, Berwick, Caithness, Clackmannan, Cromarty, Dumbarton, Dumfries, Edinburgh, Elgin, Fife, Forfar, Kincardine, Kirkcudbright, Lanark, Linlithgow, Nairn, Perth, Renfrew, Stirling, and Sutherland. Amongst the Scotch Islands it occurs in the following:—Ailsa Craig, Cantire, Harris, Iona, Islay, and Uist. In Ireland it is an inhabitant of the counties of Armagh, Clare, Cork, Down, Dublin, Galway, Kerry, and Kilkenny, of King's County, Limerick, Louth, Tipperary, Waterford, and Wicklow.

CULTURE.—Its fondness for stony habitats and for leaf-mould and old mortar must be remembered in the cultivation of this little Fern. From the fact that naturally it selects the airy position of a wallside or top, it will be understood that, under culture, it is not adapted to the close and moist confinement of a Fern case. It thrives best on the open rockery, though it may be grown in the greenhouse. If possible, when the plant is taken from its stony home, it should be detached with the stones on which it is growing,

so that its crown and rootlets may not be disturbed. If this cannot be done, the rootstock and rootlets—the latter of which often penetrate a considerable distance into the rocky or stony crevices of its habitat—should be dug out uninjured. To effect this a hammer and chisel will usually be found necessary aids. The difficulty ordinarily believed to attend the culture of this little Fern arises, we are convinced, mainly, if not entirely, from the circumstance that it is injured in removal from its home. When secured in a perfect and uninjured state it should be firmly planted, with its crown in a horizontal position, projecting beyond the surface, in the highest and driest tiers of the rockery, in some little stony crevices, and in a compost consisting of leaf-mould, intermixed with a quantity equal to it of sand, old mortar, and broken pieces of brick or soft stone. Its roots must be kept moist, but not excessively wet, and the crown should be so placed under a projecting fragment of stone as to protect it even from rain, but to enable it to receive moisture for its rootlets.

THE BLACK MAIDENHAIR SPLEENWORT.

Asplenium adiantum-nigrum.

PLATE 6, FIG. 15, PAGE 235.

FOR elegance of form, and depth and richness of colouring, the Black Maidenhair Spleenwort must take the first place—in the gradation of beauty—amongst our native Spleenworts. Its specific common name has no doubt been suggested by the likeness of its stipides to those of the True Maidenhair, both being of a dark rich purple, almost approaching black, and bearing a resemblance in colour to a dark maiden's raven hair tresses. The specific botanical name of *adiantum-nigrum* can only, however, be translated 'Black adiantum,' and can only refer to the resemblance of this Fern, in one particular, to the True Maidenhair. The word *adiantum*, as we have previously seen, comes from *adiantos*, 'dry' or 'unmoistened;' and, in the case of the True Maidenhair, refers to the power possessed by the surface of the fronds of repelling moisture. But the fronds of the present species do not repel moisture, and its name of *adiantum*, therefore, is clearly imitative, and not strictly descriptive of an individual quality. *Asplenium adiantum-nigrum*, though a rock-loving Fern, grows in greatest luxuriance upon rocks deeply veined with soft seams of earth, and under shelter of the spreading branches of plants of larger growth. Upon walls and other solid stone-work closely knit, it often grows abundantly, even under the eye

of the sun ; but under such conditions it is stunted in size and depauperated in form. Upon the loose stone-work, which in a hilly country is often employed to support banks skirting the roadways the Black Maidenhair Spleenwort will frequently be found in abundance, because such stone-work, interseamed with earth, affords, when under the shelter of trees above it, the kind of position in which this Fern delights to grow. But of all situations, the most congenial to *Adiantum-nigrum* are those afforded by a stony hedge-bank, completely draped with the branches of hawthorne, with holly, furze, or other persistent growth. The leaves falling from such hedge-banks into the moist and shadowy crevices of the loose stones of which it is built, in time add leaf-mould to the loam of the hedge-bank, and to the crumbling pieces of the stony superstructure ; and in the soil thus formed this fern luxuriates.

DESCRIPTION.—A tiny thing of an inch in length, when growing on the sunny side of walls and rocks, *Asplenium adiantum-nigrum* attains a length—stalk and leafy part together—of two feet when growing under such congenial circumstances as have been described ; and its size varies from the two extremes, according to the more or less congenial situation of the plant. The stipes is sometimes less in length than the leafy part of the frond. But the leafy part and stipes are usually equal in length, though sometimes—in the most luxuriant specimens—the stipes is double the length of the leafy part. The former is smooth, shining, and dark purple in colour, the latter a dark shining green. The rachis is green in front, but often purple along about half of its under side. The form of the leafy portion is triangular, its pinnae alternately ranged along on each side of the rachis, also somewhat triangular, and furnished with alternately-placed pinnules, which are also somewhat triangular and alternated, and—in the lower part of the frond,

and in the pinnules next the main rachis—again divided into irregularly-shaped lobes, which have their margins beautifully cleft or serrated. The basal pinnæ are the longest and most divided. The next are smaller and less divided, and succeeding ones become smaller and less divided in gradation, until they are merged in one point at the apex of the frond. In the same way the basal pinnules of each pinna are longer and more divided than those at its apex, which is acute-pointed, and the lobes of the pinnules are subject to precisely the same arrangement from base to apex, and there is the same merging of leafy divisions in the apices of pinnules and lobes as in the apex of the frond itself. The venation is singularly well defined, and consists of a mid-vein, traversing the pinnule or lobe—whichever is the ultimate division of the frond—with venules simple or forked branching from the mid-vein, obliquely towards the marginal teeth. The elongated sori follow the same direction as these veins, and are covered when young by pale green—almost white—indusia. After a little time the swelling of the spore cases bursts the indusia, the latter subsequently disappear, and finally the sori become confluent, often densely covering almost the entire under surface of the frond, the rich dark brown colour of the spore cases forming a striking and beautiful contrast with the dark shining green colour of the upper side of the frond. The rootstock is furnished with very long and very abundant fibrous rootlets. There are about twenty-five departures from the normal form of this Fern.

DISTRIBUTION.—At altitudes varying from the sea level—it often grows on sea-girt rocks—to two thousand feet above it, the Black Maidenhair Spleenwort is found in the following parts of Europe, namely, Albania, Austria, the Balearic Isles, Belgium, Bohemia, Corsica, Croatia, Cyprus, Dalmatia, Denmark, France, Germany, Greece, Hungary, Italy,

Norway, Portugal, Russia, Saxony, Scandinavia, Spain, Sweden, Switzerland, Transylvania, and Turkey. In Asia it has also a very wide range, occurring in Affghanistan, Arabia, Armenia, Erzeroum, Java, Cashmere, Russian Asia—including Siberia—Simla, and Syria. It occurs in the north, east, west, and south of Africa, namely, at Algiers, Abyssinia, the Azores, the Canary Islands, and Madeira, the Cape de Verd Islands, and the Cape of Good Hope. It is an inhabitant of parts of North America, and of the Sandwich Islands. In England it is found in Bedford, Berks, Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent, Lancaster, Leicester, Middlesex, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it inhabits the counties of Anglesea, Carmarthen, Carnarvon, Cardigan, Denbigh, Flint, Glamorgan, Merioneth, and Pembroke. It is found in Jersey and Guernsey. In Scotland it ranges through the counties of Aberdeen, Argyle, Ayr, Banff, Berwick, Caithness, Clackmannan, Cromarty, Dumbarton, Dumfries, Edinburgh, Elgin, Fife, Forfar, Inverness, Kincardine, Kinross, Kircudbright, Lanark, Linlithgow, Nairn, Perth, Renfrew, Roxburgh, and Sutherland, as well as through the islands of Ailsa Craig, Arran, Cantire, Harris, Iona, Islay, and Orkney. In Ireland its habitats are in the counties of Antrim, Clare, Cork, Down, Dublin, Galway, Kerry, and Kilkenny; also in King's County, Limerick, Louth, Meath, Tipperary, Waterford, and Wicklow, as well as in the Arran Isles.

CULTURE.—One of the most beautiful of our native species for cultivation, whether in the Fern house, the Fern case, pot, or the open rockery of the Fern garden—although it

thrives better on the open rockery than under any other method of cultivation. It should be planted in a soil consisting of sandstone—or soft briek broken into small pieces—leaf-mould and loam—be kept in the most shady parts of the rockery, and have plenty of moisture.

THE LANCEOLATE SPLEENWORT.

Asplenium lanceolatum.

PLATE 6, FIG. 11, PAGE 235.

IN the general habit and appearance of this Fern there is manifest a somewhat close relationship to the Black Maiden-hair Spleenwort. Indeed, to some forms of the latter, more especially those of young plants, *Lanceolatum* bears a very close resemblance. But a careful scrutiny in mature plants of the recognized points of distinction, will readily enable the one to be known from the other. The specific name of the present species marks its peculiar character, which is, in fact, its most obviously distinctive mark when compared with *Adiantum-nigrum*. The favourite habitats of *Asplenium lanceolatum* are upon the sheltered sides of rocks, on or near the sea-coast, in dark and moist clefts of such rocks and in dripping sea caves. Indeed, it is rarely found growing at any great distance from the sea-coast. It is often found growing in company with the Sea Spleenwort, and when, as in a sea cave, the position is excessively moist and shady, it attains its greatest development. Upon rocks on the high ground over sea cliffs, it may often be discovered growing in the most out of the way places; not unfrequently hid away in clefts and hollows so dark, that in peering into them you have to look for a little time ere the eye becomes sufficiently

accustomed to their shadowy corners, to enable you to discern the bright-green ferny forms which revel in such chosen retreats.

DESCRIPTION.—For the size of this Fern its rootstock is very thick, dark-brown in colour, tufted, and covered somewhat densely with scales. The stipes is short, owing to the elongation of the leafy portion of the frond. It is not, in fact, more than a third of the length of the latter, and is often less than a third. In colour it is of a dark chestnut, and this colour is often extended for some little distance along the rachis, more frequently along the under side of the rachis, but sometimes on its upper side, and occasionally on both sides. The upper part of the rachis is a bright green, and the leafy part of the frond is of the same shade of green. The lengths of the fronds vary according to circumstances, from about four, five, or six, to eighteen inches the longest specimens, as we have already stated, being mostly found in the congenial situation afforded by a dripping sea cave. The form of the frond, as its name indicates, is distinctly lance-shaped, broadest about the middle, tapering to an acute point at the apex, and tapering also downwards—the base in this latter respect being essentially different from *Adiantum-nigrum*, which is triangular and broadest at the base. The pinnæ are, more nearly than in *Adiantum-nigrum*, set opposite each other in pairs along the rachis and almost at right angles with the latter. They are somewhat bluntly triangular in form, broadest at the base, distinctly stalked, and again divided into somewhat irregularly shaped, but mostly into quadrate or four-sided pinnules, which in their turn are sometimes deeply cleft into lobes, if the frond be large and highly developed, but always sharply indented and decreasing in size towards the apices of the pinnæ. The venation consists of a waved mid-vein in each pinnule, and from that, simple or forked, venules

proceed to the margin of the pinnule, a venule or veinlet entering each marginal tooth or serrature. The sori in this species deserve especial attention, as affording a means of distinguishing it from *Adiantum-nigrum*. Though elongated, as in the other Spleenworts, neither the sori nor the indusia which cover them are so much elongated as in *Adiantum-nigrum*. On this account, when the fructification is ripe and the indusia have been thrown off, the sori become bulged out and assume a roundish form; and these round clusters do not generally, like the sori in *Adiantum-nigrum*, become confluent. Their margins often touch each other, but their individuality can be easily recognized. There are about a dozen varieties of the normal form of *Asplenium lanceolatum*.

DISTRIBUTION.—The recorded habitats of this Fern on the continent of Europe are in Belgium, France, Germany, Italy, Portugal, Sicily, and Spain. It has also been found in the Azores, in Madeira, in Algiers, and in Tangier. In England its distribution is somewhat local. In the county of Cornwall its habitats are, rocks on the coast at St. Ives, Land's-End, and Penzance. In Devon it is found at Salcombe and along the coast from Portlemouth to Start Point—both in sea caves by the beach, and on the rocks over the cliff head: also, upon rocks on the banks of the rivers Dart, Plym, Tamar, and Tavy. It has also been found in the counties of Gloucester, Kent, Somerset, and Sussex. Since the publication of the Second Edition of this work the interesting discovery of a new habitat of *Asplenium lanceolatum* has been courteously communicated to the Author. The Fern has been found growing in Yorkshire, on the borders of Derbyshire, by the Rev. R. Gatty, of Bradfield Rectory. The Author is satisfied, from an examination of fronds kindly forwarded to him by Mr. Gatty, as to the identity of this 'find' with true *Asplenium lanceolatum*. In Wales it is

found in the counties of Carnarvon, Denbigh, Glamorgan, Merioneth, and Pembroke. It has never been found in Scotland, and in Ireland only in the neighbourhood of Cork. It is however plentiful in Jersey, as well as in Guernsey and Sark.

CULTURE.—Especial care should be exercised with the object of keeping this Fern well drained under cultivation. This remark indeed applies to all the Spleenworts. In a pot, or under glass—either in a small case or in the greenhouse—*Asplenium lanceolatum* will thrive. It loves moisture, warmth, and shade, and a soil consisting of leaf-mould and light sandy loam, with small pieces of soft red brick or sandstone mixed with the compost.

39.

THE ROCK SPLEENWORT.

Asplenium fontanum.

PLATE 6, FIG. 17, PAGE 235.

THE common name of this Fern might appropriately be applied to all our Spleenworts, which are essentially rock Ferns. It is only therefore as a means of distinction that the name is used. The botanical name *fontanum* has no better reason for its existence; and it is retained here only because it is the name by which it is known to the majority of Fern lovers. The Fern itself is so rare in its wild state that the claim to rank it as a British species has been disputed. The evidence, however, of its having been actually found in the British Islands appears to be sufficiently satisfactory to warrant its inclusion amongst our native flora; and it is quite likely that its rarity has rather been inferred from the fact that, in the absence of a sufficiently persistent search, but few specimens have been found. The shady sides of rocks, old garden walls and sea caves are the habitat of this Fern: and upon some inaccessible rocks and in some unvisited sea caves within the British Islands it may not improbably even now be growing in abundance.

DESCRIPTION.—It would not be inapt to liken this elegant little Fern to a diminutive specimen of *Asplenium lanceolatum*. But the form of the frond is more narrowly lance-shaped than in *Lanceolatum* and it tapers more towards the base. Its outline is very symmetrical. It is broadest about

the centre, tapered to an acute point at the apex, and tapered down to its base by the gradual diminution of its pinnæ—which are set on sometimes in opposite pairs, and sometimes in alternation along on opposite sides of the rachis—until they become the tiniest of leafy expansions. The pinnæ are somewhat bluntly triangular in shape, and are divided into somewhat quadrate or four-sided pinnules, which in their turn are very sharply indented or serrated, giving a spinulose or prickly appearance to the frond. Along on each side of the rachis, and also along on each side of the mid-stems of the pinnæ, there extends a very slight leafy expansion or wing, so slight however as not to be readily seen without the aid of a glass in small specimens, but more readily distinguished in larger fronds. The stipes is extremely short, and of a very dark purple colour, almost approaching black. The usual length of the fronds is four or five inches only, but under the influence of congenial conditions of growth, and in cultivation when subjected to the moist heat of a hothouse, it attains a height sometimes of a foot. The colour of the fronds is a bright green; their texture is thick and leathery. In the venation there is no very distinct mid-vein in the pinnules. A vein proceeds from the bases of the latter, and becomes branched—a branch or venule proceeding to each of the marginal teeth. Upon the venules are borne the sori, which are first covered—each sorus—by a somewhat short though oblong scale or indusium, which, as the spores ripen, is thrown off and disappears. As in *Lanceolatum* the sori mostly keep distinct from each other. But they not unfrequently become confluent, and they then almost completely cover the under side of the pinnules. Five or six varieties of the normal form have been found.

DISTRIBUTION.—*Asplenium fontanum* ranges through the following countries of Europe, namely, Belgium, France, Germany, Greece, Hungary, Italy, Spain, and Switzerland.

It has also been found in Cashmere and Siberia. In the British Islands, as we have seen, its recorded habitats are few in number. In England it has been found at Matlock, in Derbyshire; in the Swanage Cave in the Isle of Pnrbeck, in Dorsetshire; in the neighbourhood of Petersfield, in Hampshire; also in Wharnccliffe Wood, Yorkshire. Some specimens were also found on an old garden wall at Tooting, in Surrey, but the wall appears to have been cleaned, and the Ferns all destroyed. It is also stated to have been found near Alnwick Castle, Northumberland, and by its first discoverer in Britain—Mr. Hudson—at Wybourn, in Westmoreland. In Wales it has been found between Tan-y-Bwlch and Tremadoc, in Caernarvonshire; and in Scotland upon some shady rocks near Stonehaven, in Kincardineshire. One habitat, Cavehill, near Belfast, has also been named in Ireland.

CULTURE.—The same soil under cultivation should be provided for this little Fern as for *Asplenium lanceolatum*, namely, leaf-mould and sandy loam, with pieces of sandstone or soft broken brick interspersed through the compost. It will grow readily under the protection of glass, and in pots, if the latter be kept in a greenhouse. Under the influence of heat and moisture it will attain its maximum length of a foot, but especial care must be taken to keep it well drained.

INDEX TO PLATE 12.

✓ FIG. 1. GREEN SPLEENWORT

[*Asplenium viride*]

2. PLUMED LADY FERN

[*Athyrium felix-fœmina*, var. *plumosum*]



40.

THE GREEN SPLEENWORT.

Asplenium viride.

PLATE 12, FIG. 1, PAGE 369.

BOTH the specific common name and the specific botanical name of this very beautiful Fern have been given to it in order more especially to distinguish it from the Common Maidenhair Splenwort—*Asplenium trichomanes*—which in its general appearance it very closely resembles. In the latter both the stipes and the rachis of the frond are purple-coloured. In *Viride* the greater part of the stipes and the whole of the rachis are green throughout. The habitats of the two Ferns are also somewhat different. *Trichomanes* is much the more plentiful of the two, and mostly selects a drier position on wall or rock, occurring abundantly in the vicinity of towns. *Viride* is shy of the town, being more fond of the wild moorland. It delights to grow in the shady fissures of rocks, and loves trickling water for its rootstock.

DESCRIPTION.—The fronds of *Asplenium viride* are supported on stipes of variable length, but mostly rather short. At its base the stipes is somewhat purple coloured; but the greater portion of it is a vivid green, and the same uniform shade of green is the colour of the rachis. The length of the frond varies from two or three to ten inches. In form it is narrow and tapering, drawn out to a point at its apex, usually broadest in the centre, where, however, it is seldom as much as half an inch across, and tapering slightly

towards its base. It is simply pinnate, the pinnæ being generally set in pairs, but sometimes in alternation, along on opposite sides of the rachis. The shape of the little pinnæ is roundish oblong, and their margins are finely notched or serrated, and usually attached to the rachis by a very short but distinct stem. The venation consists of mid-veins running through the pinnæ with branching venules proceeding to the marginal teeth. The sori, borne on these venules, are narrow and oblong, covered when young by indusia of the same shape, but being ultimately set free by the bursting and disappearance of the indusia, and then becoming confluent. It is to be noticed, that from the position of the sori on the venules in this Fern they appear when crowded to be clustered in the centre of the pinnæ. This is one mark of distinction between *Viride* and *Trichomanes*, for in the case of the latter the fructification, when ripe, mostly completely covers the under sides of the pinnæ. The rootstock of the present species is somewhat slender, but it is furnished with long, wiry rootlets. There are about twelve recorded varieties of *Asplenium viride*.

DISTRIBUTION.—On the continent of Europe this species is found in the following countries; namely, Belgium, Bohemia, Croatia, Dalmatia, Finland, France, Germany, Greece, Italy, Lapland, Norway, Russia, Spain, Sweden, and Switzerland. In Asia it is found in India and Siberia. In America it is an inhabitant of the Rocky Mountains. It is also found in Pern. In England its habitats are Carr-edge, in the county of Chester; Ashness Gill, Borrowdale, Borrow Force, and Gillsland, in Cumberland; Buxton, Castleton, Cavedale, and Dovedale, in Derbyshire; Falcon Clints, Teesdale, and Weardale, in Durham; Dulesgate and Staley, in Lancashire; Beacon Hill and Charley Forest, in Leicestershire; on the banks of the river Irthing, in Northumberland; and at Dovedale, in Staffordshire. It has also

been found on an old wall at Mickleham, in Surrey; also on the parapet wall of an old cellar window at Danny, ten miles from Brighton, in Sussex; at Ambleside, at Arnside, at Casterton Fell, at Farlton, at Hutton Roof, at Kendal Fell, at Mazebeck Scar, and on rocks in the neighbourhood of Patterdale, in Westmoreland; at Ham Bridge, in Worcestershire; at Aix-la-Beck, at Craven, at Gordale, at Ogden Clough near Halifax, at Ingleborough, at Richmond, on Reeth Moor, at Settle, at Swaledale, at Wensley Dale, and at Widdal Fell, as well as in other parts of Yorkshire. In Wales it is found on Brecon Beacon, and on Trecastle Beacon in the vicinity of Brecon, at Chapel-y-Fin, and upon some rocks in the neighbourhood of Capel Colbren, in the county of Brecknock; in Carnarvonshire it occurs at the following places, namely, Clogwyn-y-Garnedd, at Clogwyn-du-Yrarddu, at Cwm Idwl, Glyder Vawr, at Llyn-y-Cym, and at Twll-du; near Merthyr Tydfil, at Cilhepste Waterfall near Pont Nedd Vech, at Darran-yr-Ogof near Ystradgunlais, in Glamorganshire; and on Cader Iris in Merionethshire. In Scotland it is found in Aberdeenshire; at Dunoon, and in some other parts of Argyllshire; at Grey Mare's-tail in Dumfries; at Canlochen, and at Clova in Forfar; in Inverness-shire; at the falls of the Clyde in Lanarkshire; in the Cawdor Woods, Nairnshire; on Ben Chonzie, near Crief, on Ben Lawers, on Ben Voirlich, at Blair Athol, and in the neighbourhood of Drummond Hill, in Perthshire; also in Ross-shire; Stirlingshire; at Assynt, in Sutherlandshire: as well as in Shetland and the Isle of Mull. In Ireland it has been found at Bandon, in county Cork; in the vicinity of Lough Eask, in Donegal; on the Tork Mountain, Killarney, in the county of Kerry; and on Ben Bulbin, in Sligo.

CULTURE.—With a humid atmosphere and in a shaded position this Fern may be grown successfully on the open

rockery. Without these desiderata the Fern case or the Fern house must be resorted to. The soil should consist of sandy loam and peat with pieces of sandstone intermixed. Nearly all the spleenworts indeed will thrive admirably in such a mixture.

41.

THE COMMON MAIDENHAIR SPLEENWORT.

Asplenium trichomanes.

PLATE 6, FIGS. 6 & 7, PAGE 235.

THE specific common name of 'Maidenhair' given to this Fern—a name which has the same meaning as the specific appellation of *trichomanes*—refers to the somewhat hairlike and purple-black appearance of its stipes and rachis. It is noticeable that the pinnules, when they have become old, are brittle and easily drop from the rachis, leaving the bare stems behind. When a large number of these thin blackish-coloured stems are left standing, as they frequently are for a long time, they have very much the appearance of a tuft of hair; and this circumstance has probably helped to suggest the name of this species. Like the Wall Rue, it is a very familiar form amongst our native Spleenworts, often growing on garden, house, and church walls in villages and towns; seeming thus, as it were, to court the companionship of man. Beyond town limits it grows abundantly on rocks, bridge-arches, and stony embankments of all kinds, its wiry rootlets inserting themselves between rocky crevices seamed with earth and sand, or between the joints of masonry where the mortar has commenced to crumble and to give place to air and moisture, and to the almost imperceptible dust of

the vegetable substances which slowly accumulate in the tiniest crevices. Yet, though this is from its very nature a rock-loving Fern, and mostly found on rocks, it attains its finest proportions when growing on the moist and sheltered side of a hedge-bank. In such a position its fronds may attain a length of as much as eighteen inches, though its ordinary length is less than six inches, and, under some circumstances, it never exceeds a length of two or three inches.

DESCRIPTION.—The general resemblance between the present species and *Asplenium viride* has already been referred to. In both, rootstock and fibrous rootlets are similar. But *Trichomanes* being a much more robust and abundant, as well as a larger species, produces a greater abundance of rootlets, which are often of great length, and penetrate a considerable way through the crevices of the rocks, or the joints of the masonry on which the plant is growing. The principal mark of distinction, however, consists in the colour of the stipes and rachis, which in the present species are both of a dark-purple throughout their entire length. The pinnae in *Trichomanes* are less round than in *Viride*, being more oblong or egg-shaped, and their margins, instead of being cleft, or serrated, are usually entire. They are generally set on in opposite pairs, though sometimes towards the upper side of the frond in alternation; and so closely are they arranged on the rachis, that adjoining pairs sometimes overlap each other. In colour they are dark-green, largest about the centre of the frond, and gradually diminishing in size towards the base and towards the apex. The stipes is extremely short and brittle. The pinnae are attached to the rachis by very narrow points, which are in reality the continuation of their mid-stems. There is, however, no distinct stalk. The venation consists of forked venules, which branch from the central mid-vein

to the margins of each pinna, and the oblong sori, covered when young by their oblong indusia, are produced upon the veins well within the margins of the pinnæ, which are often somewhat curled or bent under, having thus a peculiar concave appearance. When the indusia are thrown off by the development of the spore cases, the sori frequently become confluent in two lines, one on each side of the mid-vein of each pinna. Sometimes, though not very frequently, the opposite lines unite, and then the sori are confluent over the whole of the central part of the under surface of the pinnæ. There are more than thirty variations from the normal form of the present species.

DISTRIBUTION.—This Fern has a very wide range over the surface of the world. On the continent of Europe, it is an inhabitant of Belgium, Corsica, the Crimea, Croatia, Dalmatia, France, Germany, Greece, Hungary, Italy, Portugal, Russia, Scandinavia, Sicily, Spain, Switzerland, and Transylvania. It occurs in the Azores, and the Cape de Verd islands, and in the island of Madeira; in the Caucasian, the Altai, and the Ural Mountains, in Affghanistan, in the Himalaya Mountains, in Cashmere, and in Simla. Also in Algeria and Caffraria, the Sandwich Islands, Canada, the United States of America, Mexico, Peru, Venezuela, Cuba, Jamaica, Australia, and Tasmania. In England this species is found—often in very great abundance—in the counties of Bedford, Bucks, Cambridge, Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Durham, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Hertford, Kent (including the Isle of Sheppey), Lancaster, Leicester, Monmouth, Norfolk, Northumberland, Nottingham, Oxford, Rutland, Salop, Somerset, Stafford, Suffolk, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York; and also in the Isle of Man. In Wales it is found in the counties of Anglesea, Brecknock, Carmarthen, Carnarvon, Denbigh, Glamorgan, Merioneth,

Montgomery, and Pembroke. In Scotland it is an inhabitant of the counties of Aberdeen, Argyle, Berwick, Clackmannan, Cromarty, Dumbarton, Dumfries, Edinburgh, Elgin, Fife, Forfar, Kincardine, Kirkeudbright, Lanark, Linlithgow, Nairn, Perth, Renfrew, Roxburgh, Ross, Stirling and Sutherland, and of the islands of Arran, Bute, Cantire, Islay, Harris and Orkney. In Ireland it is found in the counties of Antrim, Clare, Cork, Down, Dublin, Galway, Kerry, and Kilkenny, in King's County, Limerick, Louth, Tipperary, Tyrone, and Wicklow.

CULTURE.—As is the case with all rock or wall-growing Ferns it is essential to bear in mind that the present species will not thrive unless a proper amount of care has been taken in removing it from its home. Sometimes it will be found difficult to remove specimens with their crown root-stock and rootlets perfect and uninjured, owing to the hardness of the rock or wall, and to the depth to which the fibrous rootlets have penetrated. It is not only necessary, it must be remembered, to get out the entire plant, but to see that it has not been torn or bruised. Carelessness in these matters is often answerable for the want of success in cultivation. If possible, it is advisable to procure specimens from the soft soil of a hedge-bank, where it is easy to get up not only the entire mass of its rootlets, but some of its native soil with it. When the plant has been secured in proper condition, it may be cultivated either in the open rockery—in which case it must have an upper and airy, though sufficiently moist and sheltered, tier—in the Fern house, in open pots, or in the Fern case. For all kinds of rock-work, large or small, it is well adapted on account of the elegance and hardiness of its little evergreen fronds. The soil under cultivation should consist of light sandy loam and leaf-mould, of some small pieces of old mortar and broken sandstone and soft brick. A horizontal position, or rather an oblique position, will be more suitable for this Fern—as

indeed more or less for all the Spleenworts—than a perpendicular one, for it is obvious that when these plants are in a state of nature, growing in the perpendicular sides of rocks or walls, they must assume a more or less horizontal position.

42.

THE SEA SPLEENWORT.

Asplenium marinum.

PLATE 6, FIG. 8, PAGE 235.

THE Spleenwort of the sea, as its botanical name designates it, must, to be adequately appreciated, be seen growing at the entrance of a dripping sea cave in all the freshness of glistening purple stem, and in the rich, dark, shining green of its leafy pinnules. The mysterious influence of the sea appears to be essential to the vigorous out-of-door life of this very handsome Fern. It is very rarely indeed that it is found growing at any great distance from the coast, and even when by some curious accident plants have been reared on some rock away from the sea air, they have never been found in the perfect state of development that the sea-grown specimens attain to. There are no recorded instances of the successful cultivation of this Fern in the open air away from the sea. But it is a curious fact that under a covering of glass, at even a great distance from the sea coast, it appears to forget that it is no longer in proximity to marine influences; for in such circumstances it will attain—if heat be added to the moisture of its surroundings—its finest proportions. It may often be found upon the rocks of a little river many miles from the sea; but not beyond either the influence of the tidal influx or of the sea air. It is, however, as we have seen, only upon the wave-beaten coast that it grows in full perfection. It grows not only in the earthy interstices of the rock, but upon the solid rocky substance, and often-

times so firmly imbedded are its somewhat thick and fleshy rootlets in the stone that hours may be occupied with hammer and chisel in the attempt to get out rootstock and rootlets uninjured. At other times, however, such labour is unnecessary, and a few moments will suffice to get out the prize from the crumbling side of a damp and soft-veined rock. The most luxuriant specimens, too, of the Sea Spleenwort are not unfrequently found growing, not in, but upon the surface of the rock in dripping sea caves—the fine rootlets clinging to the damp and porous stone, and spreading like a network over it. Such specimens are the best to secure for artificial cultivation.

DESCRIPTION.—In proportion to the size of *Asplenium marinum*, its rootstock is unusually stout. Its rootlets are abundant, somewhat thick and fleshy, and of a very absorbent nature. The crown is densely covered with blackish-coloured scales. The fronds are frequently found, even in mature plants, not more than two or three inches in height, reaching an average perhaps of six inches. But in dripping sea caves on some parts of our own coasts, plants may be found with fronds eighteen inches long, and abroad, specimens have been collected from plants growing under circumstances very congenial to their development, as much as three feet in length. The stipes is rarely more than a third of the length of the entire frond, and is sometimes less than that. In colour, it is a shining dark purple, and the rachis through the greater part of its length is sometimes of the same colour, being generally green, however, towards the top. The fronds grow from the rootstock in tufts. In form they are somewhat broadly—regard being had to their length—lance-shaped, tapering somewhat bluntly to the apex, broadest about the centre and tapering slightly to the base. The pinnae, which are variously shaped, but mostly ear-shaped, or wing-shaped, are attached to the rachis—often in pairs on opposite sides of

it, but sometimes in alternation—by short stems which are extensions of the mid-veins of the pinnæ. Along the rachis on both sides is a very narrow leafy wing, and a similar leafy wing is observable along on each side of the short stems of the pinnæ, the leafy expansion in this case running into or being gradually merged into the substance of the pinnæ. Towards the apex of the fronds, the stalks of the pinnæ become less and less distinct—the leafy wings, both along on each side of the rachis and along on each side of the points of attachment of the pinnæ, becoming broader and broader—until finally the pinnæ, meanwhile also becoming narrower and narrower, merge in the substance of the leafy wings, and the whole ends in a blunt-pointed lobe at the apex of the frond. The texture of the pinnæ being thick and leathery, and somewhat opaque, the venation is not so easily seen as in most Ferns. It consists, however, of a mid-vein in each pinna. From this mid-vein there are venules on each side running obliquely towards the margin of the pinna and giving off veinlets once or twice branched. The sori are borne, on the under surfaces of the pinnæ on each side of their mid veins in long oblique lines. They are very conspicuous, and are covered in their early stage by conspicuous indusia of the same lineal form. But as the spores ripen, the indusia disappear, leaving the rich brown lines of fructification to contrast—as it beautifully does—with the dark shining green of the fronds. There are more than twenty variations from the normal form of *Asplenium marinum*.

DISTRIBUTION.--The range of this Fern will naturally be limited to the coast-lines of maritime countries. It occurs in Europe on the coasts of Corsica, France, the Ionian Isles, Italy, Portugal and Spain. Also on the north coast of Africa, and along the coasts of the Azores, the Canary Islands, Madeira, and St. Helena. It is found also on the coasts of North America, of the Bermudas, of New Brunswick, of Rio

Grande, and of Australia. In England it is found on the coasts of Cheshire, Cornwall, Cumberland, Devon, Dorset, Durham, Gloucester, Lancashire, Northumberland, Somerset, Sussex, Westmoreland, and York; of the Isle of Man, the Isle of Portland, the Isle of Purbeck, and the Isle of Wight. In Wales it is found on the coasts of Anglesea, Carnarvon, Cardigan, Glamorgan, Merioneth, and Pembroke. It inhabits the coasts of Jersey and Guernsey. In Scotland it grows on the coasts of Aberdeen, Argyle, Ayr, Banff, Berwick, Caithness, Clackmannan, Cromarty, Dumbarton, Edinburgh, Fife, Forfar, Kincardine, Kirkcudbright, Linlithgow, Moray, Nairn, Perth, Stirling, Sutherland, Wigton, and of the islands of Ailsa Craig, Cantire, Harris, Iona, Islay, Lewis, Orkney, and Uist. In Ireland it is found on the coasts of the Arran Isles, and of the counties of Clare, Cork, Down, Dublin, Galway, Kerry, Limerick, Louth, Waterford, and Wicklow.

CULTURE.—As already intimated, this beautiful Fern can be grown most successfully under glass. It should be planted as nearly as possible in the horizontal position which it loves in a state of nature, and between fragments of rock, its crown well above the surface. It should have for its rootlets a soil of sandy loam and leaf mould, with portions of sandstone rock intermixed with the soil. Copy as nearly as possible the conditions provided by the dripping sea cave, and this elegant plant will thrive luxuriantly.

43.

THE SCALY SPLEENWORT.

Asplenium ceterach.

PLATE 6, FIGS. 12 AND 13, PAGE 235.

AMONGST our native Ferns this beautiful plant is by many botanists relegated to an isolated position, where it figures—under the name of *Ceterach officinarum*—as the only native species of its genus. Yet with strange inconsistency many of those who give it a separate generic name continue to call it a Spleenwort. The principal reason for ranking it under a genus distinct from *Asplenium* appears to be founded on the circumstance that the entire back of the frond is densely clothed with scales. But this mark of distinction is not more prominent than the differences which exist between many of the species of *Asplenium*. Looking at the plant, however, rather from a natural than from an artificial and imaginative stand-point, it must be evident that the reasons for including it under the Spleenworts are conclusive: not only its general appearance, but its habits, and the mode and place of its growth, unmistakably pointing to the necessity of ranking it as a Spleenwort. The specific name as here adopted of *ceterach* can only be regarded as a distinctive appellation. The word is merely an adaptation of *Chetherak*, a term applied to it by ancient medical writers when discoursing of it as a cure for splenic disorders. Like all the Spleenworts, it is a rock or wall-loving species, growing in the stony crevices of rocks, and between the joints of masonry in walls.

Some of the finest specimens are found growing on walls under the shelter of overhanging trees, at places where the mortar has become old and crumbled, and leaf-mould has accumulated by the perpetual droppings of leaves. On house and garden walls, on churches, on bridge arches, and indeed wherever in a moist Fern country the mortared crevices of stony structures begin to open for the reception of vegetable accumulations, the Scaly Spleenwort will often be found.

DESCRIPTION.—The rootstock of *Asplenium ceterach* is tufted and scaly, and its fibrous rootlets are very abundant, sometimes in congenial situations under the sheltered coping stones of old walls, forming dense masses. On the open side of a wall or rock fully developed fronds of this Fern may often be found not more than an inch or two in length, and the length will be found to vary from that limit up to as much as eight inches, according to the more or less congenial situation of the plant. The fronds which are narrow and lance-shaped, broadest about the centre and tapering towards the base and to a blunt point at the apex are mostly pinnatifid, the margin on each side of the mid-rib being deeply cleft or scalloped into deep, wide, and rounded serratures, the marginal cutting-in being so regularly arranged that the cone-shaped pinnae or leafy projections on each side of the mid-rib present the appearance of a waved or undulated series, the base of each pinna being exactly opposite the indentation on the other side of the rachis. From this it will be recognized that the pinnae are placed in regular alternation on each side of the mid-rib. Sometimes in highly developed specimens the lower portion of the frond is pinnate, the indentation reaching quite down to the rachis, which is then bared of any leafy expansion. The entire under side of the frond—the back of the rachis as well as the backs of the pinnae—is densely clothed with light rust-coloured scales, which conceal from view both the leafy surfaces of the pinnae

and the spore cases. When for purposes of examination this scaly covering has been removed, the venation is found to consist of a somewhat wavy mid-vein, with alternately branched and forked venules, proceeding to the margin and bearing upon them elongated, but otherwise somewhat irregularly shaped masses, of spore cases. The indusium in *Ceterach* is very imperfect, consisting only of a sort of ridge, running in a line with the clusters of spore cases, but not covering them. Indeed the presence of a perfect indusium is not necessary on account of the protection afforded by the dense covering of scales. The upper surface of the frond is dark green, the rachis being sometimes of a paler green, and very clearly defined as it takes a wavy course between the pinnae ranged on each side of it. The scales on the under surface of the frond, being projected slightly beyond the leafy margins of the pinnae, afford a beautiful contrast with the deep green upper surface. There are seven or eight recorded variations from the normal form of this Fern.

DISTRIBUTION.—On the continent of Europe *Asplenium ceterach* occurs in Austria, Belgium, Croatia, Dalmatia, France, Germany, Greece, Holland, Hungary, Italy, Portugal, the South of Russia, Spain, Switzerland, Transylvania, and Turkey. In Asia it is found in Armenia, Asia Minor, the Caucasus, Erzeroum, India, Siberia, and the Ural Mountains. It is also an inhabitant of Bengal. In Africa it occurs in Algiers, and in the Azores, the Canaries, the Cape de Verd Islands, and Madeira. In England it is found in the following counties:—Chester, Cornwall, Cumberland, Derby, Devon, Dorset, Essex, Gloucester, Hants (including the Isle of Wight), Hereford, Kent, Lancaster, Monmouth, Norfolk, Northampton, Northumberland, Nottingham, Oxford, Salop, Somerset, Stafford, Surrey, Sussex, Warwick, Westmoreland, Wilts, Worcester, and York. In Wales it inhabits the counties of Anglesea, Brecknock

Carmarthen, Carnarvon, Denbigh, Glamorgan, Merioneth, and Pembroke. In Scotland it is found only in the counties of Argyle, Dumfries, Kirkcudbright, Lanark, Perth, and Renfrew. In Ireland it is found in the Arran Isles, and in the counties of Antrim, Clare, Cork, Down, Dublin, Galway, Kerry, Kilkenny, Limerick, Louth, Sligo, Tipperary, Waterford, and Wicklow.

CULTURE.—To successfully grow this extremely interesting and beautiful little Fern, a close study of nature is necessary. We have shown how the plant is found growing in its wild state. Under cultivation, therefore, a cleft in the rockery, whether in the open garden or under glass, must be selected and filled with small broken pieces of soft brick or sandstone, and old and crumbling mortar, with a little sandy loam, and plenty of leaf-mould. The plant should be inserted horizontally or obliquely, into the crevice destined for it, and in watering care should be taken that the crown is protected from excesssive moisture.

THE TUNBRIDGE FILMY FERN.

Hymenophyllum tunbridgense.

PLATE 6, FIG. 2, PAGE 235.

OUR native Filmy Ferns are the tiniest and most fragile-looking of the British species. They indeed occupy the sort of border-land which exists between the Ferns and the mosses. The common name of these Ferns very accurately represents their peculiar character, which is filmy and pellucid. The generic botanical name, *Hymenophyllum*, is compounded of two Greek words—*hymen*, a membrane, and *phyllon*, a leaf, and refers to the membranous nature of the leafy expansion of the frond. If the leafy texture of the latter be examined with a magnifying-glass, it will be found to be beautifully reticulated, or its thin and almost transparent substance to be woven of vegetable fibres like network. The specific name of the present species refers to the fact of its having been first noticed as a British Fern in the neighbourhood of Tunbridge Wells. It is mostly found growing on the damp surfaces of shady rocks, situated either along some watercourse or in damp woods. But not unfrequently it has been found clothing the trunks of trees in or near streams, or in very damp and sheltered situations, and occasionally even growing amidst moss on the ground. In such situations it is commonly found growing in company with mosses of various kinds, its hairlike rhizomas and root-lets being intermixed with the mossy roots. We have found

both the Filmy Ferns growing in great abundance upon the sides of a hill bordering a moorland stream, and covered by great masses of rock, amongst which there were trees and much other vegetation of a dwarfed or herbaceous kind. The situation was an extremely moist one, great mists occasionally rising from the river, and enveloping the hill-side. Clambering from rocky mass to rocky mass, we discovered that in numerous dark crevices formed by the overlapping edges of several rocks, the whole internal surface of stone was densely covered by a carpeting of *Hymenophyllum*, which was especially plentiful and luxuriant where trickling moisture oozed down from the higher hill-side along the internal surface of the rock. So dark were some of these rocky holes, that one could not look into their depths; and sometimes in order to reach the spreading masses of *Hymenophyllum*, it was necessary to lie down along the top of the rock, and stretch out the hand at arm's length. In many places, however, so moist was the entire atmosphere of the district, that the open tops and sides of great boulders were densely carpeted with Filmy Ferns, the thick masses of their rhizomas and rootlets having no depth of earth, but merely clinging to the damp surface of the boulders.

DESCRIPTION.—The peculiar colour of the fronds of *Hymenophyllum tunbridgense* affords one mark of distinction, for it is a very dark olive green. In length they are from one to two or three inches, sometimes when very luxuriant being found as long as six inches. Vast quantities of the plant will, however, be found not more than an inch or two inches in length. The stipes varies in length, sometimes being very short, and sometimes as long as the leafy portion of the frond, black in colour, and scarcely thicker than a hair. The rhizoma is about the same thickness, and it creeps extensively amongst mossy and other roots, throwing up a

little forest of crowded fronds. So thickly do the rhizomas, with their tinier fibrous, wiry rootlets, grow together, that they often form masses several yards square on the surface of a wide rock, and the masses are frequently so compact that they can be stripped off in sheets, for they hold together almost as firmly as the interwoven mass of a door-mat. The frond is ovate in form, and may be described as a series of branched, very tiny, but rigid black veins, margined throughout by thin, pellucid, semi-transparent leafy expansions or wings. The veins branch alternately from the waved rachis or mid-vein of the frond on each side of the rachis, the branches or pinnæ being again divided into oblong, blunt-pointed pinnules, which are generally arranged in pairs on each side of the mid-veins of the pinnæ. The appearance of these branched pinnæ is not unlike the branching of some threads of coral. On closely examining the margins of the pinnules, or winged expansions, it will be discovered that they are spinulose, or very sharply toothed with bristling points. The frond is broadest in the centre, and tapers towards the base, and bluntly towards the apex, in each case by the gradual shortening of the pinnæ. The arrangement of the fructification in this Fern is extremely interesting and beautiful. The spore cases are borne not in little heaps at the backs of the fronds, but they are contained in little urn or cup-shaped receptacles or indusia, which are hoisted, so to speak, on the apices of the veins, which branch out of the mid-stems of the pinnæ next and on each side of the main rachis. The veins bearing the cup-shaped indusia (which are indented on their upper margins) are very short—so short, that to the naked eye the urn-shaped indusia appear to be seated almost on the mid-stems of the pinnæ. The veins which, branching from the latter, bear the cup-shaped indusia, enter at the base of and project into the cup, and around those parts of them which are

inside, the spore cases are clustered. The indusia are at first green, but ultimately become brown in colour, and are always so prominent as to be readily seen placed near the angles formed by the main rachis and the mid-stems of the pinnæ.

DISTRIBUTION.—This Fern has been found in Belgium, France, Germany, Italy, Norway, and Sweden. It is also an inhabitant of India, of the Azores, the Cape of Good Hope, the island of Madeira, and of the Mauritius; of Brazil, of Chili, of Australia, and of New Zealand, and Tasmania. In England its recorded habitats are as follows:—In Cheshire, amongst the hills between Buxton and Macclesfield, and in the vicinity of Croydon brook. In Cornwall on the Rough Tor, a mile or two from Camelford, and also in the neighbourhood of Penryn. In Cumberland at Ennerdale, and at Hawl Gill, Westwater. In Devon at Becky Fall, near Moreton, in Bickleigh Vale, in the neighbourhood of Shaugh Bridge, on Staple Tor, and on Vixen Tor—all on Dartmoor. In Kent at Tunbridge Wells. In Lancashire, at Cliviger, at Conistone, at Greenfield near Saddleworth, at Rake Hey Common near Todmorden. In Somerset, at Shepton Mallet. In Sussex, at Ardingly, at Balcombe, at Cockbush near Chichester, at Handcross, in Tilgate Forest, and at West Hoathly. In parts of the county of Westmoreland. In York, in the neighbourhood of Halifax, and in Esk Dale near Whitby. In Wales it is found in Brecknock; in Glamorgan, at Cilhepste and Melincourt Waterfalls, and at Pont-nedd-Vechn; and in Merioneth, at Cwm Bychan near Barmouth, on Cader Idris, at Dolgelly, at Crofnant near Harlech, at Rhaiadr Du near Maentwrog, and in the Vale of Festiniog. In Scotland its habitats are: in the county of Argyle at Bullwood, at Dunoon, and at Glen Gilp; in Dumbarton, on the banks of Loch Lomond; in Dumfries, at Drumlanrig; in Lanark, on the banks of the Clyde; in the county of Peebles; and in the

islands of Bute and Mull. In Ireland the habitats of *Hymenophyllum tunbridgense* are in the following counties:—In Clare, at Feacle; in Cork, at Glengariff, Bantry, at Ballenhassig waterfall, at Dunbullogue Glen, at Glenbower, at Lota Wood, and at Killeagh. It is stated to have been found in the neighbourhood of Dublin. In Galway it grows at Ballynahinch, and at Connemara. In Kerry, at Glen Carnn, in the neighbourhood of Killarney, as well as in other parts of the county. In Wicklow at Glencree, and in other parts of the county.

CULTURE.—It must be borne in mind that it is only under glass that this beautiful Fern can be grown at all under cultivation, and the nature of the soil and general treatment must be the same as suggested for *Trichomanes radicans*.

THE ONE-SIDED FILMY FERN.

Hymenophyllum unilaterale.

PLATE 6, FIG. 3, PAGE 235.

THE distinction between our two native Filmy Ferns was first noticed by Mr. W. Wilson, a botanist, and on this account the present species is frequently called by the specific name of *Wilsoni*. The term *unilaterale*, 'one-sided,' is, however, here retained as being a descriptive appellation. It has been stated that the range of *Unilaterale*, throughout the world, is co-extensive with its near relative *Tunbridgense*. In the British Islands, however, though both are frequently found growing together in equal abundance—*Tunbridgense* in some localities being even the more plentiful of the two—*Unilaterale* has a somewhat wider distribution, especially in Scotland and Ireland. Both grow under the same, or similar, conditions, and these have been fully described in the case of *Tunbridgense*, in the preceding section. But *Unilaterale* is believed to prefer a situation higher with regard to the sea-level, and more exposed than *Tunbridgense*, a belief which, doubtless, finds proof in the fact that it is found growing alone at greater elevations. The same fact would appear to account for its greater abundance in Britain, though it does not satisfactorily dispose of the statement that the range of the two plants is co-extensive in other parts of the world. It may be suggested, however, that this particular statement is again open to question; for

it must be remembered that the researches of our botanists have been necessarily limited, and the fact that a particular Fern is more or less plentiful in the localities which have been searched, cannot be accepted in proof of the general abundance or scarcity of the same Fern in localities which have not been searched.

DESCRIPTION.—The general resemblance, or resemblance at first sight, of the present species to *Hymenophyllum tunbridgense*, necessitates that the description of *Unilaterale* should be directed to an indication of the points of difference between the two ferns. The caudices and rootlets in both are alike, as also are the colour of the fronds and the general habit and mode of growth—the caudices of the one being, in fact, often densely interwoven with those of the other on the surface of the same rock. The stipes in both is similar, and the pellucid and semi-transparent texture of the fronds is also similar in both, the fructification is produced in the same manner, and the indusia are similar in shape. The frond of *Unilaterale*, however, is narrower and more lance-shaped than that of *Tunbridgense*, the pinnæ being—and this is the chief point of distinction—decidedly one-sided—that is to say, instead of the divisions of the pinnæ being equally produced on both sides of their mid-stems—the secondary rachides—as in *Tunbridgense*, they are produced on the upper side only. The pinnæ are, therefore, simpler and less divided; and their mid-stems or veins are convex on the upper side, so that the points of the pinnules are sometimes bent back and directed downwards. With the aid of a magnifying glass, it will also be noticed that, whilst the cup-shaped indusia in *Tunbridgense* are fringed or indented on the upper margins, in *Unilaterale* they are entire or smooth. When the two plants are seen growing side by side, it will be noticed that the pinnæ in *Tunbridgense* overlap each other somewhat like

the tiles on a house, and the frond has, consequently, a more compact appearance from the greater crowding of its pinnæ and pinnules than is the case in *Unilaterale*.

DISTRIBUTION.—So far as botanical researches have been made, the range of this Fern abroad is, as we have seen, co-extensive with that of *Tunbridgense*. In England the present species is found in the following counties:—In Cornwall near Bodmin, on the Rough Tor near Camelford, at Carn Brea in the vicinity of Redruth, and on Granite Tor. In Cumberland, at Borrowdale, at Bow Fell, at Scale Force near Buttermere, at Dalegarth, at Ennerdale, at Gatesgarth Dale, at High Still, at Honister Crag, at Keswick, and at Lodore Fall. In Devon in Bickleigh Wood, on Great Mist Tor, Longaford Tor, Sheeps Tor, White Tor, and Vixen Tor, at Moreton, and in Wistman's Wood, Dartmoor; at Shaugh Bridge, and along the West Lyn. In Kent. In Lancaster, at Thevilly near Burnley, near Bury, and in some caves at Greenfield; also near the town of Lancaster. In Northumberland at Jurionside. In Shropshire, in Treflack Wood near Oswestry. In Staffordshire, at Gradbitch near Flash. In Westmoreland at Ambleside, at Langdale Pikes, at Patterdale and at Stock Gill Force. In York near Lower Harrogate, at Hawl Gill near Mickleton, and at Turner's Clough, Rushworth. In Wales it occurs amongst the mountains of Brecknockshire. In Carmarthenshire. In Carnarvonshire at the following places:—Falls of the Llugwy, Capel Curig near Llanberis, Rhaiadr Mawr, Rhaiadr-y-Wenol, and Cwm Idwal, as well as generally through the Snowdon district. In Cardiganshire at the Devil's Bridge, at Hafod, and at Pont Bren. In Glamorganshire growing under the Melincourt Waterfall, and upon some rocks near Scudeinon-Gam. In Merionethshire at Dolgelly, at Festiniog, at Rhaiadr-y-Mawddach near Llanetyd, and at Rhaiadr-Du near Maentwrog. In Scotland it is found in Argyleshire at the following

places :—Crinnan, Dunoon, Glen Finnart, Glen Gilp, and Glen Moray. In Ayrshire at Dalmellington, and in Glen Ness. In Clackmannan at Castle Campbell, Dollar. In Dumbartonshire on the Bowling Hills and on the Banks of Loch Lomond. In Dumfriesshire at Delvine Pass, Girpel Lane, Kirkpatrick-juxta, Grey Mare's Tail, Moffat Dale, and Nithside. In Forfarshire, by the Reeky Linn on the Isla. In Kirkcudbrightshire. In Peebles. In Perthshire at the following places, namely—Ben Lawers, Finlarig Burn near Killin, Glen Queich, in the Ochils, Pass of Leny, Banks of Loch Katrine, and Rocks in the Trosachs. In Renfrewshire on rocks near Gourock. In Sutherlandshire. Also in the islands of Arran, Harris, Islay, Mull, Orkney, and Shetland. In Ireland it is found in the following counties and places :—In Antrim, at Colin Glen, Belfast, by the Glenarve River, near Cushendall. In Cork in glens near Youghal. In Morgan's Glen, Clonmel. In Donegal on the Ennishowan mountains. In Dublin county; in Galway at Connemara, Oughterard, and other places. In Kerry at Killarney, and also amongst the mountainous districts of Kerry. In Londonderry. Amongst the mountains of County Mayo. In Tipperary; and at the following places in Wicklow, namely, at Glendalough, in Hermitage Glen, at Powercourt waterfall, and in other parts of that beautiful county.

CULTURE.—Precisely the same conditions of culture are needed for this Fern as for *Trichomanes radicans* and *Hymenophyllum tunbridgense*.

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Spores in Gaurinellia Antenna 1920

1. Ladyfern

2. Little Bladder Fern

3. Common Clubmoss Sporangium

4. Tree Sporangium

5. Limestone Sporangium

6. Three-branched Polyzooid

7. Hard Bristly Shield Fern

8. Bristly Toothed Bristle Fern

9. Black Bristle Fern

10. Green Sporangium

In England

1. Hottentot

